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CONTENTS

U. S. Naval Training Service. By Rear-Admiral A. C. Dillingham, U. S. N. 343

The Enlisted Personnel. By Lieut.-Commander T. P. Magruder, U. S. N. 375

A Study of Naval Strategy. By Commander R. Daveluy, French Navy. Translated by Philip R. Alger, U. S. N. 391

Early Voyages of American Naval Vessels to the Orient. By Charles Oscar Paullin. 429

Wilkes' and d'Urville's Discoveries in Wilkes Land By Rear-Admiral J. E. Pillsbury, U. S. N. 465

The Destroyer—Our Naval Weakness. By Lieut.-Commander Yates Stirling, Jr., U. S. N. 469

An Early "Globe-Circling" Cruise. By Edgar Stanton Maclay, A. M. 481

A New Method for Determining the Final Diameter of a Ship. By Naval Constructor D. W. Taylor, U. S. N. 501

The Motor Drive. By Asst. Naval Constructor Richard D. Gatewood, U. S. N. 507

Notes on the Solution of the Triangle of Position without Trigonometrical Computation. By Professor Guisseppi Pesci, of the Italian Naval Academy. 529

The Cutler-Hammer Manufacturing Company's Differential System of Turret Training Gear. Prepared by Commander W. H. G. Bullard, U. S. N. 543

The U. S. Naval War College. By Rear-Admiral Stephen B. Luce, U. S. N. 559

Discussion 587

Professional Notes. Prepared by Prof. Philip R. Alger, U. S. N. 595
Ships of War, Budgets and Personnel.—Ordnance and Gunnery. Torpedoes.—Marine Engineering.—Miscellaneous.

Book Notices 648

List of Prize Essays. 657

Special Notice.—Naval Institute Prize Essay, 1911. 662

Advertisements.

UNITED STATES NAVAL INSTITUTE PROCEEDINGS.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

U. S. NAVAL TRAINING SERVICE.

LOCATION OF TRAINING STATIONS AND HABITATION BEST SUITED FOR TRAINING PURPOSES.

SYSTEM AND METHODS OF TRAINING.

ORDINARY SEAMEN FROM TRAINING STATIONS IN FLEET.

By REAR-ADMIRAL A. C. DILLINGHAM, U. S. Navy.

(1) It is found that officers of the service and people generally, are not familiar with the scope and methods of our naval training service. Large sums of money have been appropriated for training purposes and a system of training has been developed, the purposes of which, if appreciated, would create a great professional interest in the subject, and would compel officers of the fleet to realize the absolute necessity for their cooperation with the training service in order to better the condition of the enlisted personnel, with reference to the needs of the service.

(2) The purpose of this paper is to lay before the general service the results that are obtained from the present system of training, with a view to having more seriously considered how best to apply, and to follow up these results to increase the efficiency of the fleet.

The questions—first, how best to train recruits; second, having spent four years in the education of recruits, how best to retain these men for continuous service, are second in importance to no other questions effecting the efficiency of the navy.

(3) It has been found that the preliminary training given recruits can best be accomplished ashore, so that the training ships have been abandoned, and the Government has established naval training stations at San Francisco, Newport, Chicago, and Norfolk, Va. At Norfolk there is officially no training station, there never having been any appropriation for the specific purpose of training at that place, although, as a matter of fact, it is the most important station in operation. The demands made by the Navy Department upon this station are greater than the demands upon other stations.

(4) In considering the subject of naval training, I will take up in order, first, the conditions that should govern the location of a naval training station and habitation best suited for such a station; second, the present system and methods of training recruits; third, the ordinary seamen from training stations in fleet, the perpetuation in fleet of the training received at training stations, with a view to securing continuous service men.

(5) The training service is a recognized important institution of the navy, but with its present organization there is no head to the service, consequently, the system of training, which has been approved by the bureau, is liable to be deranged, as each station will be administered more or less in accordance with the individuality of its commandant.

At present the method of administration is by official or personal letters from the commandants and executive officers of training stations to the officer of the Bureau of Navigation who has charge of the enlisted personnel. Such a method is unmilitary and unbusinesslike, and can secure no good results.

The officer in charge of the enlisted personnel has as much as he is physically able to attend to with the legitimate duties of his important office, and the training service, though bearing intimate relation to the office of the enlisted personnel, suffers from want of consideration and study by a competent head detailed for that purpose.

As each training station requires the most rigid supervision by its commandant to get desired results, so does the training

service require a rigid supervision by a competent head, in order to maintain the system of training, and an economical military administration of the service.

THE CONDITIONS THAT SHOULD GOVERN THE LOCATION OF A NAVAL TRAINING STATION AND THE HABITATION BEST SUITED FOR SUCH A STATION.

In locating our naval training stations, we have not sufficiently considered the importance of good climatic conditions, or the military reasons that should influence the selection of the site, nor, in erecting the habitation at these stations, have we sufficiently considered the necessary sanitary conditions which must exist in order to get desired results.

Unless we are governed by other than service motives in locating naval stations, it would seem to be a very simple matter to select a proper or suitable site for a training station. Let us suppose that the Government desires to establish a training station in a certain locality; a board consisting of a line officer and a medical officer, who have had experience in training matters, and a civil engineer, are ordered to select the best available site in the desired locality. If the sanitary conditions are satisfactory, the military consideration will follow, and the civil engineer will be an aid in making estimates, considering drainage, etc.

When Coasters Harbor Island, Newport, was accepted for training purposes, the system of training did not contemplate the use of extensive barracks ashore; Coasters Harbor Island became a rendezvous for apprentices, from where they were drafted to vessels of a training squadron, which vessels were sent to cruise in a desirable climate for training purposes; in the summer usually going to Europe, and in the winter to the West Indies.

The climatic conditions existing at Newport were recognized as being unsuitable for training purposes, and when the old or former system of training was changed to the present system, where the apprentice seamen are quartered on shore, the training squadron abandoned, and all instruction and training taking place on shore, the unfit climatic conditions should have been considered, and a more suitable locality sought.

I can find no sanitary or service reason whatever; for having located a training station at Chicago, a thousand miles from the coast, with a climate in no way suitable for training purposes: so

far as the training service is concerned Chicago is suitable only for a small rendezvous for recruits from recruiting stations en-route to Norfolk, Va.

Experience has proved, that, for sanitary and military reasons, the first consideration in selecting a locality for the training station, is climatic conditions. The climate should be temperate, not too hot in summer, nor too cold in winter, such a climate as will allow men to be trained out of doors all the year round, and where the life at the training station is more or less out-of-door life; such a climate will least affect the recruit in the change of climate he is subjected to in coming from the recruiting station, or from his home. The training station should be located as conveniently as possible for the quick and economical supply of men to the fleet, and where the lines of communication, by rail or boat, are good or convenient; in other words, the locality should possess good climatic conditions for training purposes, and be strategetically well placed with reference to the supply of men to the fleet, and as a rendezvous for recruits.

To-day most of our recruits come from the West or Middle West; many of them have been leading out-of-door lives, and to bring such recruits to a climate that necessitates an in-door life is bad in every way.

Recruits entering the service between September and February who are sent to Newport or Chicago will pass most of the four months allowed at training stations for training, indoors, the climate at these stations during the winter often for six or seven months of the year, necessitates an in-door life. What greater detriment to good health or healthy physical development could be possible? The grave infectious diseases, which have occurred at Newport and without a doubt will occur at the new naval training station near Chicago, particularly to those recruits of the military age, are pneumonia, cerebro-spinal meningitis. These are infectious diseases of the gravest nature for the recruit, not only on account of their high mortality, but also their dreaded after effects causing permanent mental and physical injury to those attacked. These two diseases prevail principally in cold climates, during the winter and spring of the year. Many lives would be preserved and expense to the Government saved, by training these recruits in a milder climate, that will permit of their living an out-of-door existence during the entire year, which cannot be done at Newport or Chicago.

It is only necessary to compare a draft of men from Newport who have been at that station during the winter months, with men from a station where an out-of-door life is possible during the same season, to realize the great benefit of the temperate climate, to say nothing of the better training that can be had in a temperate climate. The men from the milder climate are better developed and show in their bronzed faces the good effect of out-of-door life. Apprentice seamen at training stations need, and should have all the fresh air and sunshine possible; this with good physical development, on a healthy full diet, and constant occupation, will best and soonest fit the recruit for battleship work.

As an example of a locality with almost ideal conditions for a training station, I would give the vicinity of Norfolk, Va. This locality is near, and most convenient to Chesapeake Bay, the great strategic rendezvous of the fleet on our Eastern coast, and close to the anchorage at Hampton Roads. There are seven railroad lines, two steamship lines, and three steamboat lines which have their terminals at Norfolk, and the climate is not too hot in the summer or too cold in the winter to prevent an out-of-door life, the men can be drilled and trained out of doors all the year round. Some idea of the importance of this locality (vicinity of Norfolk) for training purposes and as rendezvous can be had when we consider that the Navy Department has found it necessary to send to Norfolk some 26,000 men in the past three years, and has sent to the fleet a yearly average of about three thousand apprentice seamen, who have undergone training at that place.

The great possibilities of this strategic locality make it almost certain, that with the increase of the fleet, the Government will be obliged to have its principal training station and rendezvous there in the near future, and it is apropos of this consideration that it is well now, to study plans for the best possible habitation for our men.

At all training stations, as at any place where it is necessary to have a permanent or semi-permanent habitation for a considerable number of men, there will always develop contagious diseases; many of our recruits come from the country and have escaped diseases of childhood which prevail in cities and towns, such as mumps, measles, etc. This condition will probably exist

with any practicable habitation, but it is our business, in designing the habitation, to meet the demands of modern sanitation and so reduce the possibility of diseases to minimum, or if we cannot prevent the introduction of diseases, we may at least have conditions that will be best suited to combat with contagion and prevent epidemic.

As the object of training stations is to supply the fleet with fairly well trained men in the shortest possible time, and as apprentice seamen remain only four months under training, and frequently it is necessary to draft them to the fleet after they have been but three months or less under training, it is obvious that to get any results we must do everything possible to prevent contagion, and transporting it to the fleet.

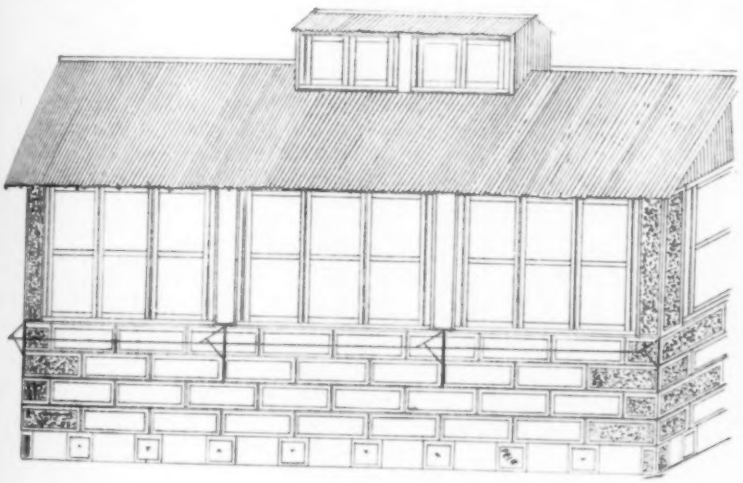
It may be said that this is all very true, and is well known and understood, but the fact is, we have not considered these sanitary and climatic conditions that are necessary for an efficient training station, in the selection of the sites and creating the habitation thereon. Conditions in Newport have been improved at great expense and much inconvenience, but it is quite impossible to maintain 1700 to 2000 men in such barracks, on such a small surface space as is there available, and expect to get good sanitary results. The same can be said of Chicago, with the addition that Chicago is even worse, by being 1000 miles from the coast. The station at San Francisco is inadequate, particularly with the possible advent of a Pacific fleet, and the climate is bad, the topographical features of the island prevent expansion, or the erection of a proper habitation. The locality to the southward of San Francisco, San Diego for instance, has splendid conditions available.

Experience has proved beyond the shadow of a doubt that the best habitation for a training station is one that will allow the best sanitary, and military supervision; and that such supervision can best be accomplished by the segregation of the men into as small units as is practicable; thus giving a means of locating disease, *making quick diagnosis* and of being able to confine contagion to the fewest number of men, this, when coupled with a proper system of isolation of the men who have been in contact with contagion, will accomplish all that is possible.

For military supervision it is found most efficient to have these units consist of a squad and a squad leader (9 men), although

medical officers would prefer a smaller unit, it is agreed that if the house to contain nine men is of sufficient size, and properly planned, good sanitary results will be had.

The recruit arriving at the training station is assigned to a particular squad, in charge of a squad leader; this squad belongs to a particular section in charge of a chief of section; this section belongs to a particular company in charge of a chief petty officer instructor. This organization as perfected in the newcomers habitation is continued as nearly as is possible through the course of training.



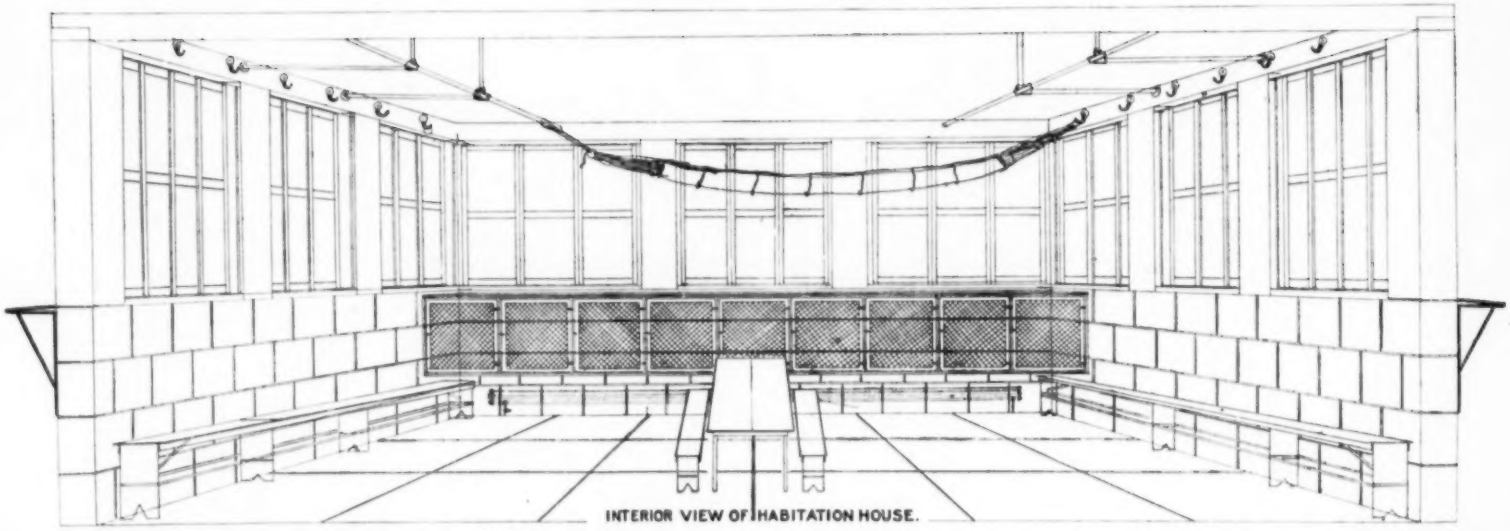
A'

HABITATION HOUSE OF CEMENT WITH HAMMOCK RAIL.

It is presented that the habitation best suited for a training station would consist of houses designed as shown in exhibits marked A', A''. Each house to house a squad and its leader (9 men), that these houses be arranged in groups, each group to consist of ten houses which will house a division of 75 men (this number is assigned to a division because it is found that with that number it will be possible to have a tactical company in formation neglecting absentees for whatever cause).

A group of houses with its attached buildings is arranged as shown in exhibit B.

The entire habitation will consist of these groups, the number depending upon the allowed complement of the station, and will be separated from each other.

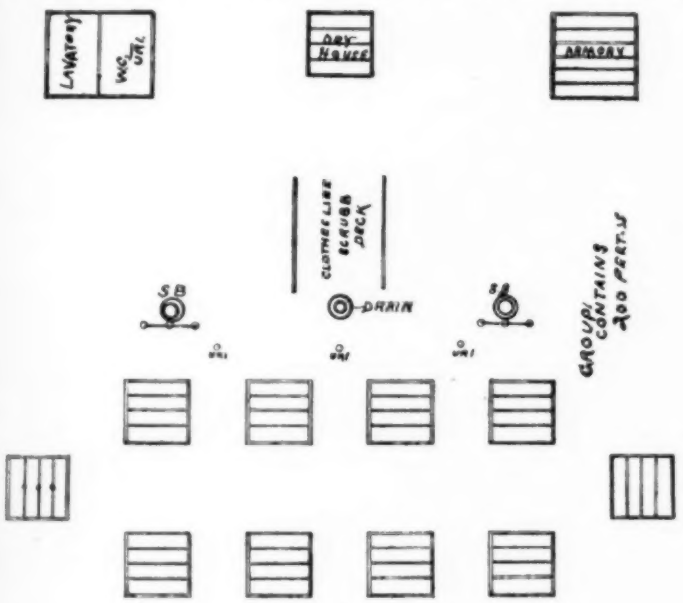


INTERIOR VIEW OF HABITATION HOUSE.

A''

Each house is provided with nine wire lockers for bags; and with overhead slat shelving for stowing hammocks in inclement weather (hammocks should never be stowed in fair weather, but should be opened and exposed to the sun and fresh air. The brackets on the side of the houses are for the purpose of hanging unlashed hammocks when the weather permits), and two sanitary spit kits.

Houses are heated by steam and electrically lighted, and, with the occupants are in charge of the squad leaders, who are respon-



B

HABITATION GROUP WITH BUILDINGS FOR ONE COMPANY.

sible to their chiefs of section, who in turn are responsible to their chiefs of company.

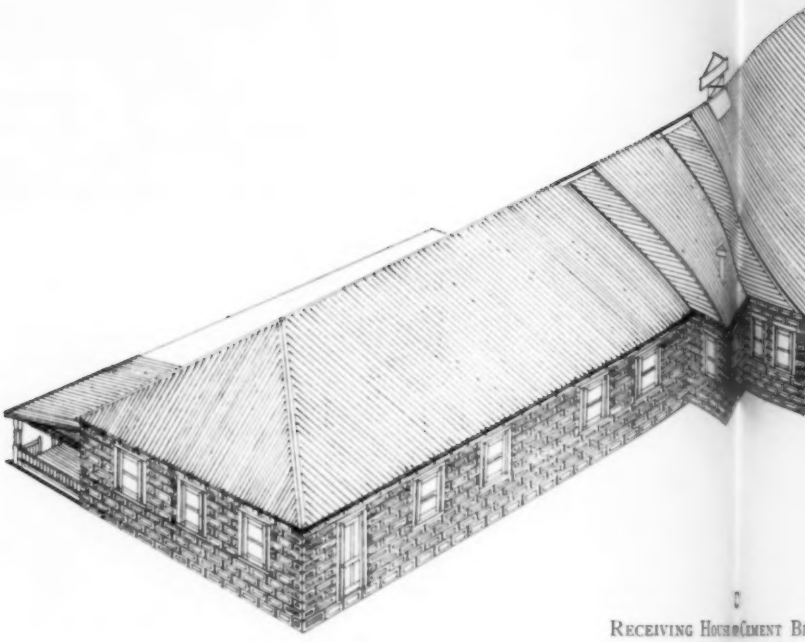
Each group is provided with the following facilities, located as conveniently as possible, and upon a cement surface having proper drainage:

House containing showers and toilet facilities for 75 men.

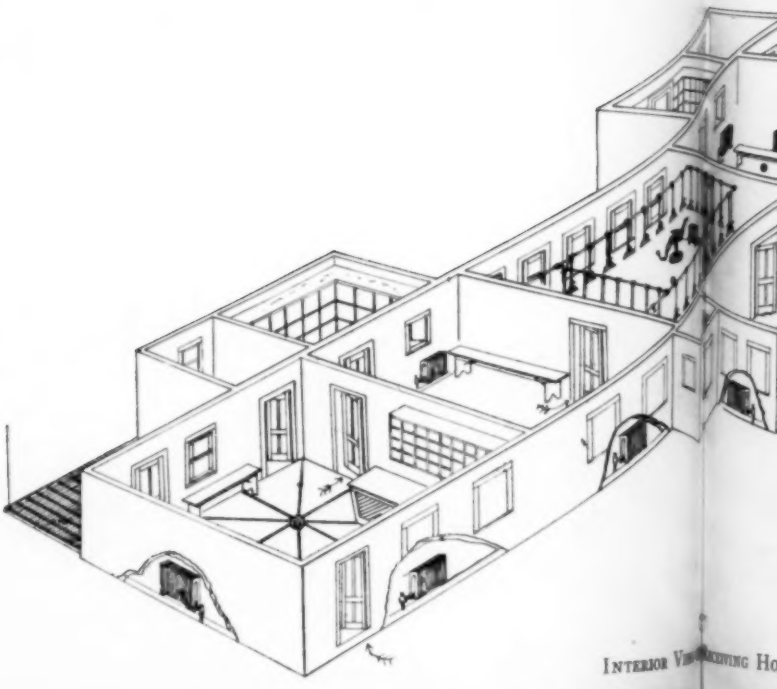
Sanitary scuttle-butt.

Properly located detached urinals.

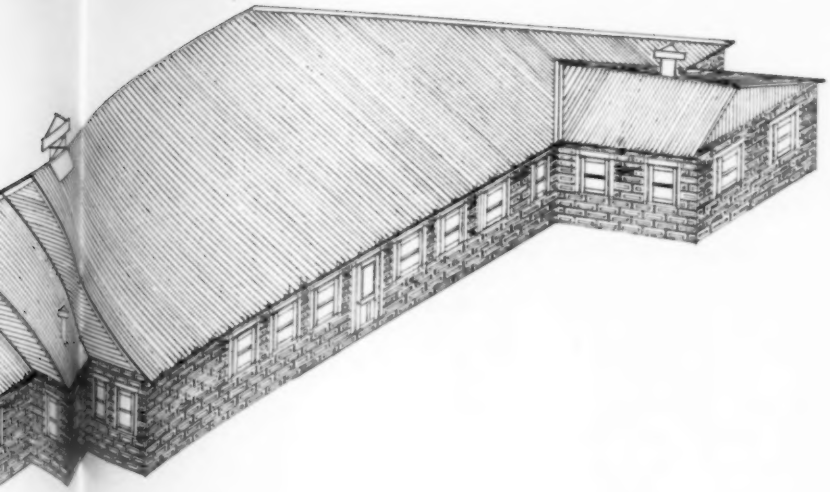
Floors for scrubbing clothes, clothes lines, and steam drying room.



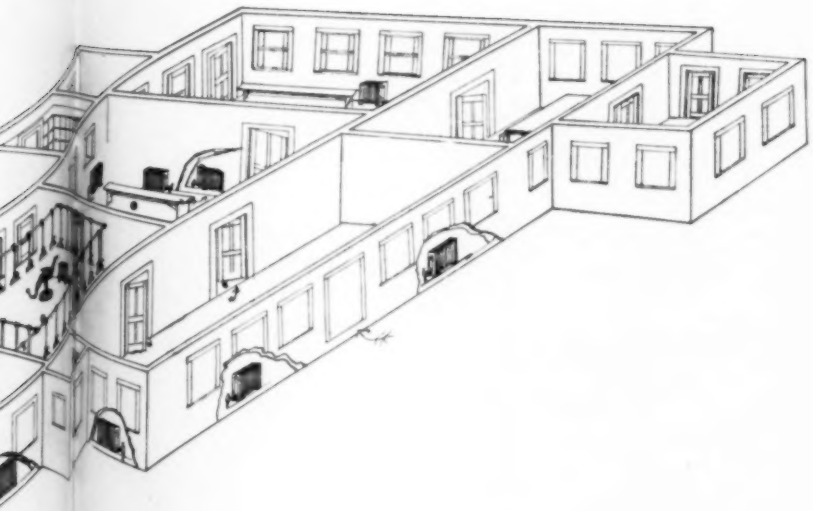
RECEIVING HOUSE—CEMENT BU



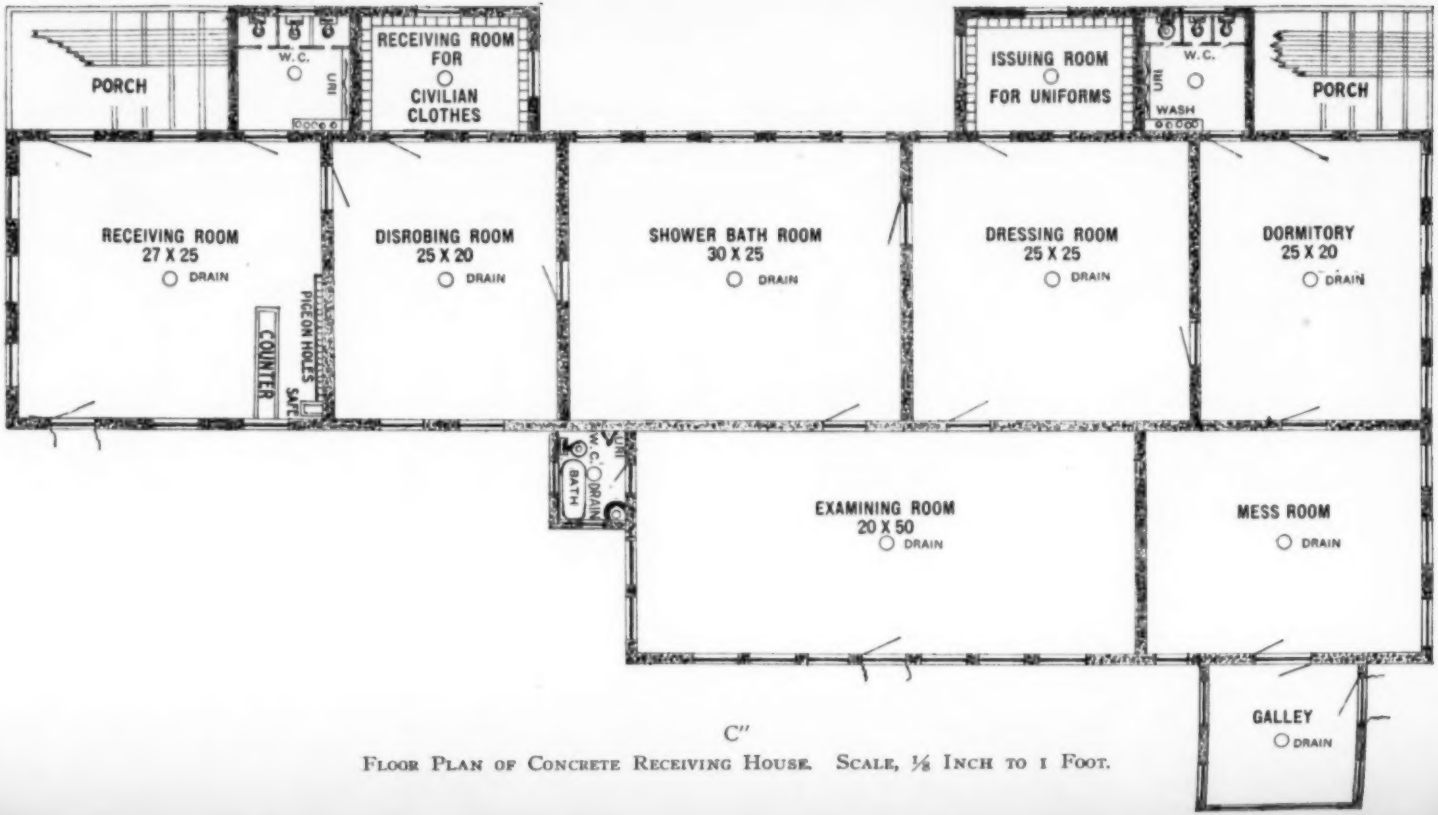
INTERIOR VIEW—RECEIVING HO



VING HOUSE OF CEMENT BLOCKS.



TERIOR VIEW OF LIVING HOUSE.



C″

Floor Plan of Concrete Receiving House. Scale, ⅛ Inch to 1 Foot.

Armory for racking 75 rifles, and stowing equipments. This armory to be also used as a reading, writing, smoking and instruction room. Referring to smoking—it is found best at training stations in order to prevent excessive cigarette smoking to have regular hours and to confine smoking to certain places.

One fire extinguisher.

Store house for scrub and wash gear, implements for policing, etc.

The remainder of habitation will be as follows:

Receiving house for receiving recruits;

Recruits are received from the recruiting stations about the country in drafts containing, at times, as many as 60 men. In handling these recruits the greatest precautions must be taken to prevent the introduction of disease to the station, and for this purpose a receiving house is provided. See plans marked C′, C″, C‴.

The recruit enters the receiving room, where he deposits valuables and money he may have, from the receiving room he passes into an adjoining room, where he undresses and deposits his clothes, then passes to the next room where he is shaved, has his hair cut and takes a bath; passing to the next room, he has clean uniform clothes served out to him, and, after dressing, passes into the next room which is the dormitory. Connected with this dormitory is a mess hall. The recruit passes from the dormitory to the examining room, and from there, if his physical condition is satisfactory, he is transferred to the newcomers group.

One mess hall, galley, bakery and storerooms for every six groups.

One gymnasium and recreation hall, arranged to be used for Divine services, lectures, entertainments, etc., for every six groups.

One swimming pool for every six groups.

One house for rigging loft and instruction in battleship seamanship, for every six groups.

Drill shed for drill purposes in rainy weather.

Small arms target range. This is possible in a populated locality, with the use of the safety-firing device, designed and used at the Norfolk station.

One elevated sounding platform for each group.

Boiler house and distilling plant for entire reservation.

Electric generating plant for entire reservation.

Ice plant and cold storage for entire reservation.

Incinerator.

Paymaster's storehouse.

Commissary storehouse.

One pulling cutter for every 20 men of allowed complement.

Steam launches, tugs and transportation barges to meet requirements.

Stable and fire-engine house.

Shed for wagons and implements.

Horses and carts.

Motor ambulance.

There should be placed around the grounds used by the apprentice seamen shallow boxes filled with sand for expectorating into. Using these boxes soon becomes a habit and is an excellent sanitary precaution. The boxes are, of course, policed as required.

Mess hall and galley for chief petty officers, if no quarters are provided for chief petty officers.

Sick quarters and dispensary as designed and located by the Bureau of Medicine and Surgery.

Administration building.

Commissioned officers quarters.

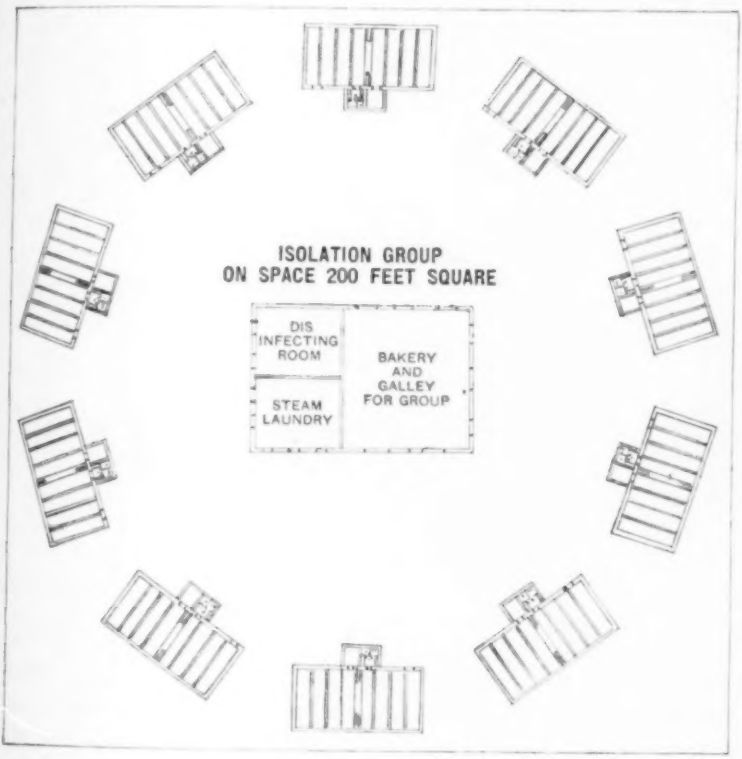
Quarters for chief petty officers and their families. This provision is an innovation but I am sure that if it could be allowed, the good results would prove that it was a wise provision.

Naval training stations are allowed one chief petty officer instructor for every 50 apprentice seamen. For an allowed complement of 1000 apprentice seamen there will be 20 chief petty officer instructors. This is in addition to the chief petty officers who belong to the detail of general service men at the station. Most of these chief petty officers are married and with their families live, at present, usually near the reservation. As suitable quarters, I would suggest apartment buildings at moderate expense. Each apartment to contain five rooms with bath, etc. (Parlor, pantry and dining-room, three bed-rooms, bath, etc.)

Chief petty officers receive no commutation for quarters, they are at considerable extra expense when attached to training stations, and they are doing duty formerly done by commissioned and warrant officers. If they lived upon the reservation it would

add greatly to the efficiency and contentment. I would strongly urge this provision for chief petty officers at training stations.

Connected with the habitation there will be one group, or more if needed, to be used as an isolation group. The houses of this group to be built as shown in exhibit marked D′, D″, D‴. This isolation group will be properly located for its purposes, and provided with the following:



D′

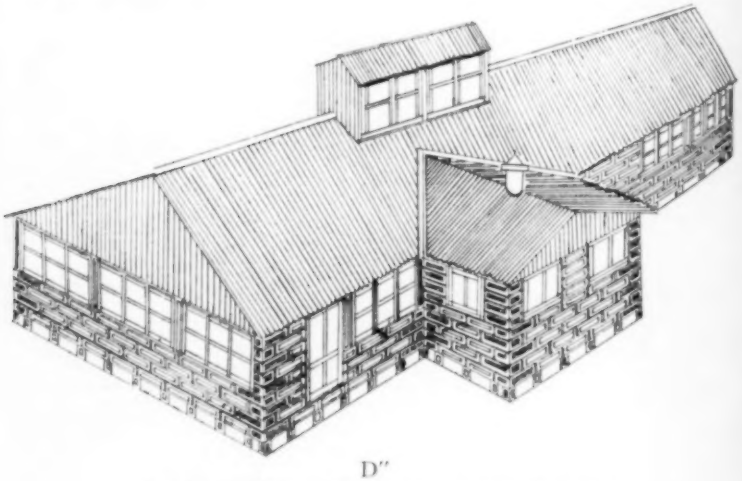
One galley and bakery with serving room and store-room.

One steam laundry.

One disinfecting plant.

This group will house the men who have been in contact with contagion, and as provided, small units of men can be absolutely isolated and maintained indefinitely. This group to be entirely under the supervision of a medical officer. No provision is made

at any of our stations for the isolation of people who have been in contact with contagion: such isolation is absolutely necessary to prevent epidemic. The Newport station has provision for isolation in the newcomers or detention barracks only. At Norfolk tentative improvised quarters for isolation have been erected. At all stations, isolation quarters should be a recognized necessary part of the habitation. Where a large number of men are quartered in the same barrack, it is quite impossible to provide isolation. In case of contagion it becomes necessary to isolate the entire barrack, and frequently the entire station: this has been the case several times at Newport, and will be the case at Chicago.

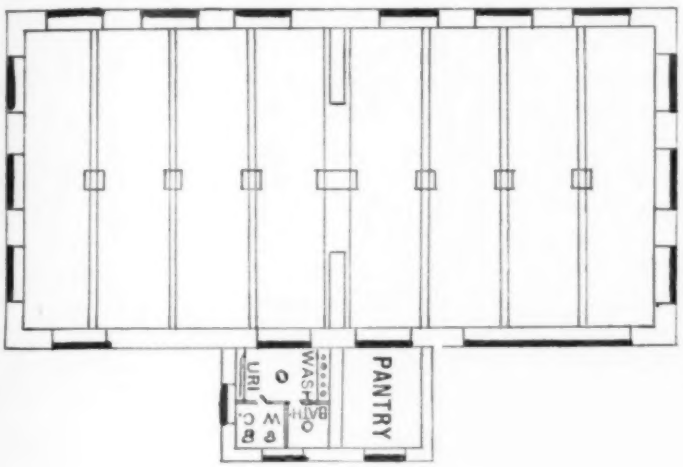


D"
Isolation House Built of Cement Blocks.

Disease is caused by soil contamination, organic matter expectoration and urine. There should be the very best and most thorough policing, and in order to provide for a proper and efficient policing, cement will be used for house construction and the surface occupied by the houses of a group, and this surface so graded as to give best drainage. Experience at naval stations has proved the advantage of cement for such purposes, and it is highly recommended by the French who have had much experience with the material. Cement floors and surfaces are easily cleaned and will quickly dry, particularly in houses heated by steam. They will not retain dirt or dampness. This cement surface for groups affords a simple means of efficient drainage

and produces no dust. For construction of houses it is cheaper than wood or iron, prevents accumulation of dirt and saves labor and time in policing.

With the habitation proposed, the houses are suitable for any climate that is suitable for training purposes. In the plan proposed, the principle of segregation is carried as far as is practicable, and isolation is provided for those who have been in contact with contagious disease. The two provisions of segregation and isolation are absolutely necessary for an efficient habitation, for without them, it is quite impossible to prevent epidemic, the



D'''

Floor Plan of Isolation House, 18 × 36.

habitation is sooner or later isolated or quarantined with contagion, which prevents all transfer of men to the fleet.

The expense of such a habitation where cement or concrete is used in the construction of houses and for surface, is small when compared with the large sums of money that have been spent at Chicago, Newport or San Francisco.

At the Chicago station, with a capacity of 2400 men, there has been expended to date, $3,250,000.00.

At the Newport station, with a capacity of 2000 men, there has been expended for public works since 1881, $1,310,618.00, and for maintenance, $578,694.00, making a total of $1,889,312.00.

At the San Francisco station, with a capacity of 500 men, there

has been expended since 1898 for public works $344,250.00, and for maintenance since 1900, $391,675.37, making a total of $735,925.37.

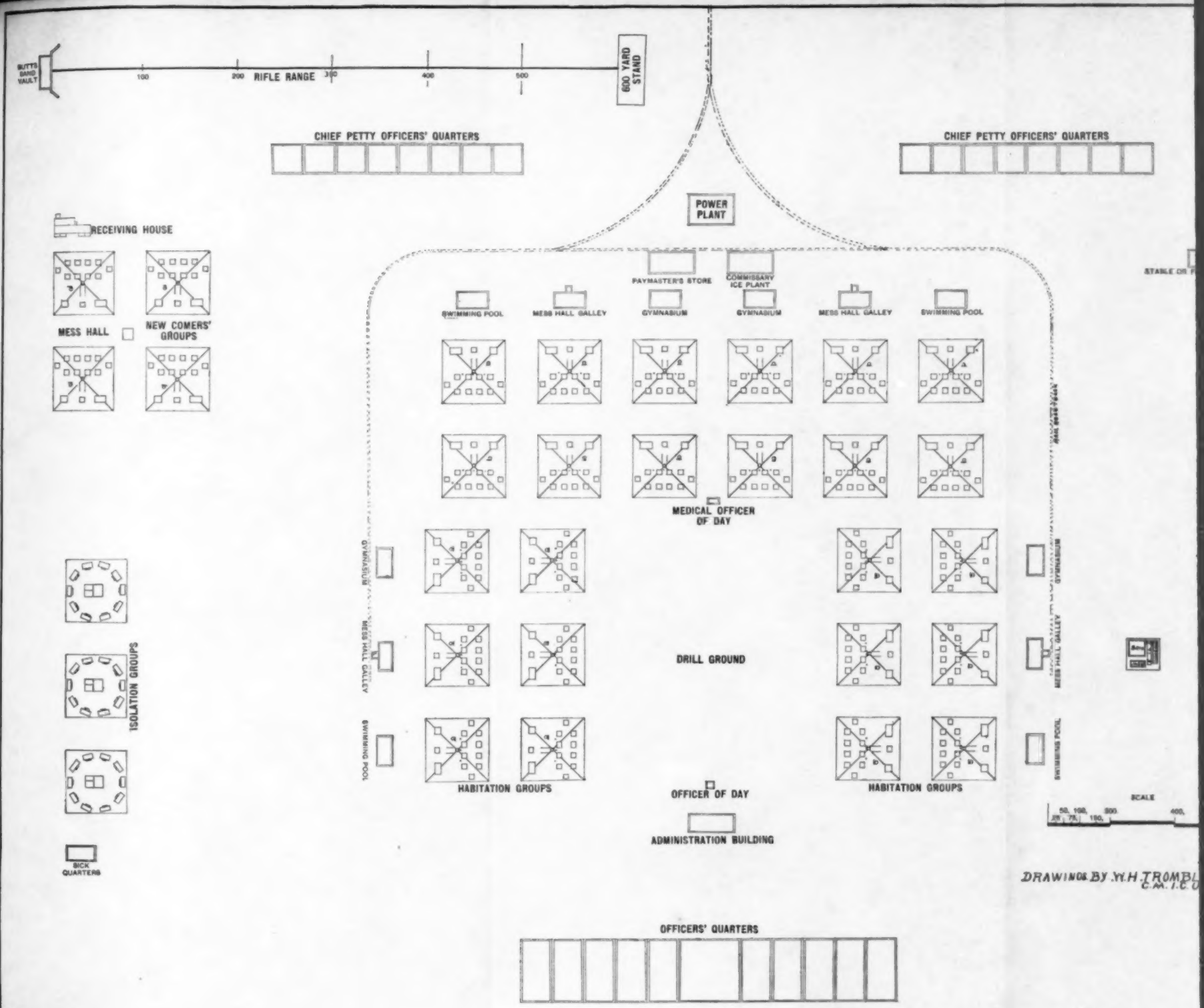
A careful and liberal estimate for a plant such as is exhibited by plan marked E, calls for $600,000.00. It would not be necessary to adhere strictly to the plan, in locating groups, the topography of the site might require a deviation from this plan, but the principles of segregation and isolation must be adhered to.

PRESENT SYSTEM AND METHODS OF TRAINING RECRUITS.

It was found that the practice of taking very young undeveloped boys into the service, for training, did not meet the requirements of modern fighting ships, where, the weights to be handled, and the work to be done, are beyond the capacity of such lads. Also, that the system employed did not meet the requirement of supplying the fleet with men in the shortest possible time. The latter requirement was made more apparent by the shortage of enlisted force throughout the fleet, and the necessity for getting men as soon as possible, with new ships to be commissioned.

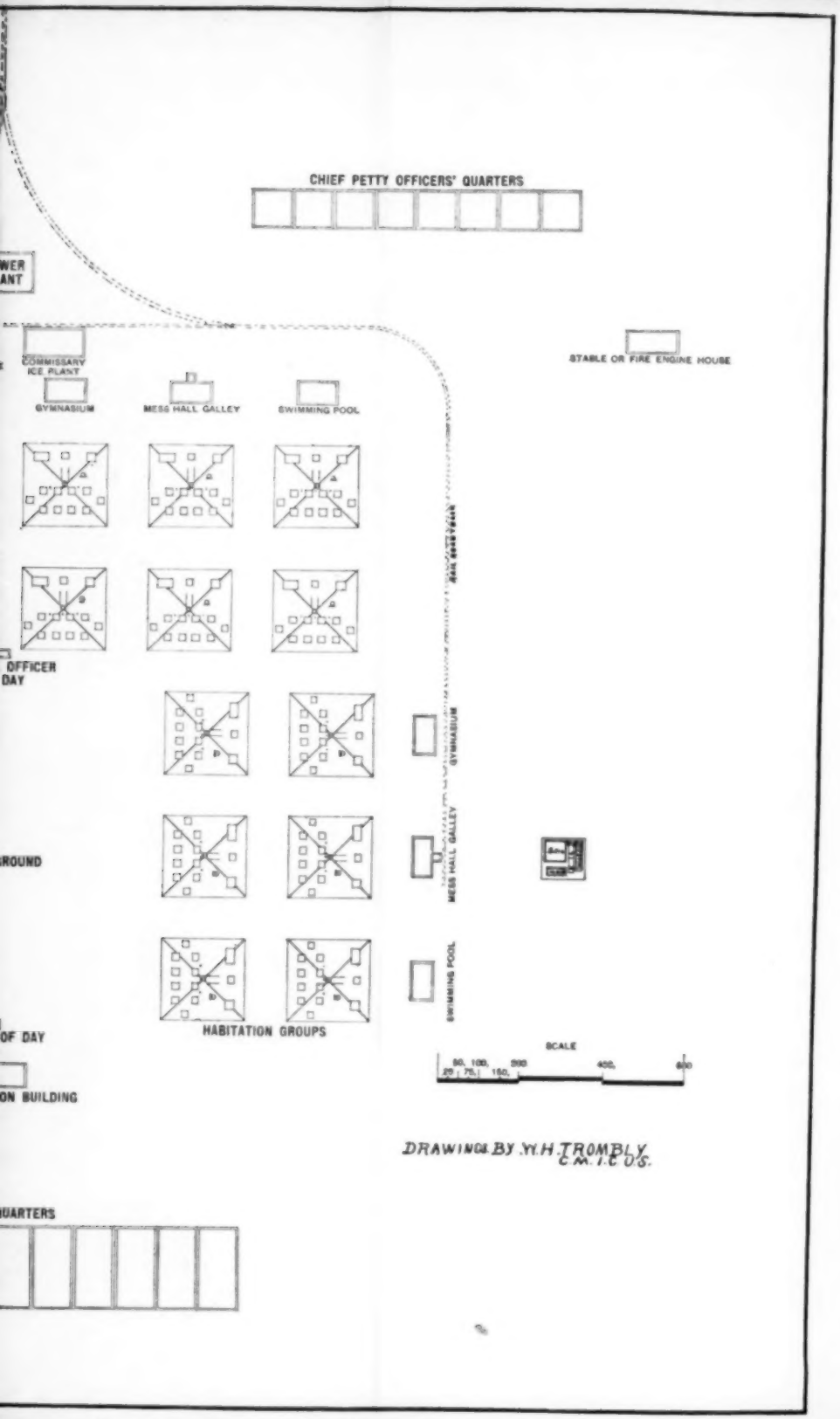
The Bureau of Navigation decided, that to meet these requirements, recruits, rated apprentice seamen, should be received into the service for the seaman branch, between the years of 17 and 25; that these apprentice seamen shall go through a preliminary course of training at training stations for a period of four months, at the end of which time, the apprentice seaman is rated ordinary seaman, and transferred to the fleet, where his preliminary training is to be continued.

The exception to this is the case of coal passers for the engineer's force, where any apprentice seaman who has aptitude for the engineer's force, who desires to enter that branch of the service, and who can pass the physical examination for that rating, is retained at the training station for a period of three months, at the end of which time he is rated coal passer, and transferred to the fleet. The Bureau of Navigation has established a machinists' school at the Norfolk Navy Yard, the object of which is to afford the same opportunity to apprentice seamen and others entering the artificer branch (engineer's force) to become chief petty officers and warrant officers, as is afforded those who enter the seaman branch. Men with good records, holding the rating of watertender oiler or fireman first class, and having an average mark in both mechanical ability and knowledge of



PLAN OF HABITATION BEST SUITED FOR TRAINING STATION OR RENDEZVOUS SHOWING MEANS OF SEGREGATION AND ISOLATION. CAPACITY, 2100 MEN. ESTIMATED COST, $600,000

PLAN E



ATION AND ISOLATION. CAPACITY, 2100 MEN. ESTIMATED COST, $600,000.00, COMPLETE.

marine engines and machinery (taken from their enlistment record) of not less than 75 per cent, who are recommended by their commanding officers, are eligible upon re-enlistment for instruction in this school. These conditions are carefully explained to the apprentice seaman before he elects the branch of the service he will enter. There are other schools established for the professional education of enlisted men as follows: The Artificers' School, and School for Musicians located at the Norfolk station; the Gunnery Schools at Washington and Newport; Yeoman School and School for Cooks, at Newport; Electrical School at San Francisco and New York. There is also a School for Hospital Apprentices, located at the Naval Hospital, Norfolk. It will thus be seen that the Navy Department is properly alive to the necessity for the proper professional education of the enlisted men.

The fleet requires intelligent, able-bodied young men, who have had sufficient preliminary training to enable them to take care of their persons, their bags, and hammocks—who realize the military character of their chosen profession, and who have advanced far enough in professional knowledge to rid the commanding officer in fleet, of the delay in getting his vessel ready for battle, that would be caused by receiving raw recruits.

Much has been written about the training of men for the naval service, and the systems employed by foreign naval powers have been investigated, to gain knowledge which might be of use to us in training our own men. But the character and intelligence of the American recruit are such that he requires a system of training for his particular case. Formerly, the navy was recruited from the fishing fleets and the merchant marine, men who already had the sea habit, men who had the sailors' trade, and who were accustomed to the discipline which exists on all well-regulated ships, whether of the merchant marine or the navy. These men bettered their conditions by entering the navy, and had only to learn the military part of their new surroundings and belonged to a class of men, who generally speaking, had no ambitions beyond the rate of petty officers. To-day most of our recruits come from the West, the middle West, and the lake regions, men absolutely ignorant of nautical affairs, but ambitious to learn and advance. Our navy has become such an institution in the land, that there is no difficulty in securing the enlistment of Americans, filling the requirements of the law.

Much embarrassment has been caused by not having a sufficient number of men in the allowed complement of the navy to meet the requirements of the fleet.

This shortage in the allowed complement is not caused by inability to enlist men, but by the sudden demand for a large number of men to fill the complement of our new ships, going into commission.

If the enlisted force could be increased with each ship appropriated for, by the number of men necessary to man that ship, this embarrassment would disappear, and our excellent system of recruiting would supply the vacancies as they occur from time to time. The conditions to-day are abnormal, caused by the sudden demand for a large number of men to man the new ships added to the fleet.

In not allowing an increase in the complement for the fleet, an abnormal condition arose which becomes more difficult as new ships are added to the fleet.

Under normal conditions, the number of desirable candidates is sufficient to meet the demands of the fleet.

Mention is made of this condition because it seriously effects the results to be obtained in the training service. With the shortage of men for the fleet, it becomes necessary to draft men from the training stations before they have finished their preliminary training.

The recruit for the naval service, is, to-day, generally an intelligent young man, belonging to a highly respectable and important class of our citizens. He comes, usually, with the influence of our democratic institutions shown in his character, with very little idea of the military character of the business he is undertaking; all of which is perfectly natural when we consider that our country is not a military country.

Our navy is a military institution in a non-military country, and this condition is the cause of many of the difficulties we have to contend with; and not the least of these difficulties is found in trying to instill into the recruit, the military character of his calling.

For these reasons, and with the higher intelligence of our recruits, our training system must differ greatly from that of any other nation.

The best results are obtained at our training stations by making them absolutely military institutions, beginning with the recruit

tactically, I may say, receiving him in a military manner, placing him at once in a tactical formation, and requiring him ever after to form, march, and be dismissed according to tactics. By this means, it is found that the tactical habit is very quickly acquired; the recruit prefers it; and the military character of his business is ever kept before him.

To illustrate this; at training stations a recruit is received in formation, placed in a squad led by a squad leader; he is always in the school of that squad, until he graduates into the fleet. His squad belongs to a section; the section to a company; and his company has its own mess, quarters, and parade. His company commander and instructor is a chief petty officer selected for his aptitude for that service; and in this organization the recruit goes through the training station. The company petty officers are selected from apprentice seamen, and given acting appointments as such. These acting appointments make part of the record of apprentice seamen having them. They go with their record to the fleet, and after inspection by the commanding officer in fleet, are returned to the owner.

This company belongs to a battalion, the battalion has its parade; the battalion belongs to a brigade, which has its parade.

All instructors and drill masters are chief petty officers, selected for their aptitude for such duty, and are as follows: one brigade commander, one adjutant, one chief of company for each company. The instructors follow with their company or division through the entire course.

The detail of chief petty officers for such duty gives excellent results both with apprentice seamen and as a school for these chief petty officers.

This duty was formerly performed by commissioned officers, and later by warrant officers, but the results were not as good as are now obtained, because the chief petty officers are better adapted for this duty, they can get in closer touch with the recruit. The chief petty officer is required to pass a rigid examination before being accepted as an instructor, and though the duty of instructing recruits is most arduous and difficult, the detail to training stations is popular with the chief petty officers on account of, first, the excellent status given to chief petty officers at training stations, and again from the fact that they are assured at least two years of shore duty, when they can have a semblance to home life with their families. Training stations are allowed

one chief petty officer instructor for every 50 apprentice seamen, so that at a station with a capacity of 2000 men, there will be some forty chief petty officer instructors, and it would be well if all line chief petty officers in the navy could have a tour of duty at training stations. With the apprentice seamen brigade there is required but two commissioned officers, one as inspector of drills and instruction, the other as inspector of target practice. A foreign admiral who lately visited the Norfolk station, and who inspected the apprentice seamen brigade, was most impressed by the fact that all instructors were chief petty officers, and declared it was evidence of the high order of intelligence of our enlisted men.

Seventy-five apprentice seamen compose a division, as it has been found by experience that this number, with all absentees for any cause whatever, will give for all formations a tactical company.

At all formations—breakfast, dinner, supper, and for three drill periods—the squad is led to its section; the two sections form a company on the company parade. The company goes to the battalion parade, and the full brigade is formed, presented, and marched away, with full band and field music, at time, for not less than 120 steps to the minute.

It is found that this brigade formation can take place, and the units marched off for whatever purpose in less time than could be done by any method not tactical. That requiring all units, of whatever size, to always march at not less than 120 steps to the minute, gives snap and vigor, and it very quickly becomes the habit of the recruit to step out on all occasions in this snappy way.

At the training stations there are six brigade formations a day, with full band and field music. Each formation can be done tactically in about six minutes. This method, with the strictest requirement of military etiquette in the matter of salutes, gives excellent results in creating military habit. Everything possible is done to convince the recruit that he has entered a profession which offers him such good opportunities for advancement, that he has strong inclination to consider seriously making it a profession for life, but as the recruit spends only four months of his enlistment at the training station, there is left three years and eight months for the fleet to convince him that he will re-enlist.

The short time (four months) allowed apprentice seamen at the training station indicates that the Bureau of Navigation ex-

pects only a preliminary training at the station, and that this training shall be in detail, that which shall give the best results in the given time.

To this end, the instruction is limited to subjects that the recruit can require in four months, and these subjects are given time according to their importance in preparing the man for the battleship training.

It should always be remembered that, if you make a man comfortable and happy, you are going to get out of him all that is in him, and that there are ways of handling men so that you can get an immense amount of knowledge into them without their realizing any effort on their part. It should always be remembered in dealing with recruits that they should be favorably impressed with their calling, and that it is most desirable that men shall re-enlist, and remain in the service permanently.

In the matter of discipline at training stations, the individual character of the apprentice seaman is studied, being careful to award punishments that will not degrade the man, or lessen his own self-respect, always remembering that the young man comes from a non-military life, and, above all, that he is an American. It is not desirable at training stations, to have a classified list of punishments for the apprentice seamen, for a punishment that would accomplish the object and meet the requirements of the service in one case, might not be as efficacious in another case; the offense may be the same by name, yet the intent is entirely different, and the degree of guilt will vary.

It is not desirable to make deprivation of liberty a punishment, except where the offender has proved himself to be unreliable, and commits offenses when on liberty that he would not have the opportunity of committing were he deprived of liberty. Such cases are usually incorrigible and are best dealt with by discharge as undesirable.

There can be no fixed rule for inflicting punishments; in dealing with the recruit of to-day, it must be remembered that he is an American; that he is young and high-spirited, and generally unused to restraint; that the matter of discipline must be taught rather than inflicted.

The apprentice seaman is a young man, developing physically, and requires amusement and recreation.

Young men, never used to discipline or military requirements, can very easily become disgusted and disheartened, and it re-

quires tact to lead them through the training station so that they will realize they have made no mistake in coming into the navy.

At training stations, all drill and instruction ceases at 3 p. m., and the last formation of the day is at 5 p. m., for supper.

Wednesday afternoon, Saturday, and on Sunday, after Divine service in the morning, the apprentice seamen are allowed boats for sailing or pulling excursions. This privilege for men from the interior of the country is considerable, and at the same time, gives instruction.

Apprentice seamen petty officers are allowed liberty on Wednesday p. m., Saturday and Sunday; the other apprentice seamen, Saturday and Sunday.

At the training stations, we are now getting the most remarkable results by a system of what might be called "concentrated drills." To illustrate this, I will give the routine of the drill period from 7.50 a. m.: to 9 a. m., known as the "Setting Up Period," which is done each day except Saturdays, Sundays and holidays.

At 7.50 the brigade is formed, under arms, presented, and the following evolutions take place, after having saluted the colors at 8 a. m., viz:

Brigade on line; distance taken to the front; arms grounded; step left; physical drill without music; take flags (small flags stowed in the leggings when not in use); semaphore drill, with music; return flags; step right; take arms; physical drill, with arms, to music; arms grounded; at ease; to straighten belts, etc., to rear assemble; manual of arms; all firings; squads right; change directions to the left; column of companies; right by sections; form company square, flankers left and right into line, double time; form company; companies left; companies right; squads right; companies column left; change direction to the left; companies left front into line, double time sections, right and left turn, double time (street riot); form company; form company square; form column of sections; squads left; sections, right front into line; column of companies; close in mass; take full distance; street column; form square; street column; column of companies; line of squads on ( ) squad; brigade, halt; as skirmishers; rally by squads; as skirmishers; rally by sections; as skirmishers; rally by company; as skirmishers; assemble by squads; assemble by companies; companies left, dismiss.

This period is a daily routine. It would be foolish to put recruits through the school of the battalion, or brigade, but the

results obtained from this period in company, battalion, and brigade movements, from the mere force of habit, are remarkable for precision, and tactical correctness. The recruit, in exercising his legs, had better do tactical movements.

Excellent results have been gotten from "concentrated drill" with boats. After the men have been instructed individually in the boats, the boats moored head and stern in line, 16 of them, the drill begins; and together they perform everything that is done under oars; also step masts together; make sail together; shorten sail together; furl sail together; unstep masts together. This is proceeded with until finally the eight boats are sent out under oars and the eight weather boats under sail, odd or even numbered boats forming separate divisions and getting under way separately, for drill under sail.

As it is probable that we will always have life-boats ready for lowering, at training stations there are life-boats, fitted in all respects according to regulations, the gripes and other appliances for the boat having been made by the apprentice seamen; the apprentice seamen are exercised in the life-boat service; at a late inspection, life-boat crews from a division picked at random were able to pick up a dummy man, thrown into the water at some little distance from the boat, the life-boat was down, man picked up, and life-boat hoisted again in less than four minutes, the dummy man was properly placed in the boat, and the means for restoring apparently drowned applied.

In the matter of boats the apprentice seamen at training stations stand ready to compete with any boats' crews in the fleet, for good pulling, handling boats under sail, the boat habit, and with the life-boat, and upon several occasions the apprentice seamen have won out in regattas with general service men.

Frequent regattas are had in pulling and sailing, prizes for which are supplied by the ship's store.

Below is given a list of subjects arranged in order of the importance that a knowledge of each has in producing the desired results.

1st. Cleanly habits: the care of the person and the contents of bags and hammocks, necessitating frequent rigid inspections.

2d. Physical development; setting up drills. This is carried on as explained for the "setting up period."

3d. Qualifying on the target ranges with revolver and rifle, according to the firing regulations. If men go to ships in commission qualified in the firing regulations, much time is saved

aboard these ships where the facilities for small-arms practice are few, and the opportunities for such practice not frequent.

Apprentice seamen who have displayed qualities on the target range that lead the instructors to believe they will make good gun pointers, have memorandums to that effect attached to their enlistment records. The commanding officer in fleet can thus try out these men for gun pointers, which might save considerable time.

4th. Seamanship: It matters not how great the changes in the class of ships shall be to meet the requirements of modern naval war, so long as ships shall fight at sea, we must have seamen. With the passing of spars and sails we have not lost the art of seamanship, but with the modern battleships we have added mechanical ability to the seaman's trade. Handling spars and sails was only a small part of the old seamanship. There will always be what might now be called battleship seamanship which includes, conning, steering, compass, lead and log, both hand and patent, boats under oars, or sail, or power, lowering boats and life-boat work; marline spike seamanship, hitches and bends, handling hawsers and fasts, manipulating wire rope, carrying out anchors, ground tackle, purchases and tackles, rigging derricks, slinging stages, spreading, housing and furling awnings, etc., ship and sea habit.

5th. Signals: comprising all the codes in use in the navy. The semaphore is taught at setting up, where the man, using small flags, goes through the code to music, and also at divisional instruction. Young men are usually much interested in signalling, and find much pleasure in being proficient. They acquire this knowledge very quickly, and become very expert. Appliances for signalling are at the disposition of the apprentice seamen, at proper hours, day and night.

Apprentice seamen who show special aptitude for signalling are given a special course in signals, and are recommended on their enlistment records for detail to the signal corps.

6th. Ordnance: Lectures in the simplest form, upon kinds of powder used in the service, shells, fuses, guns, etc.

Company, battalion and brigade drills. Once a month, the brigade is exercised in "battle drill" with blank ammunition, a section of the artillery and its support being the enemy. At this drill, a field hospital is established, and the first aids to the wounded are applied.

The manual of guard duty is taught the apprentice seamen and it is found that the recruits for the naval service can be as quickly and as thoroughly taught the duty of sentries as men for any other branch of the service; guard is mounted each day, and the apprentice seaman can hold his own, in proficiency, in this duty with any military organization.

There is no sentry so zealous as a recruit, and to have our man-o-wars-men good sentries to do good duty on post, it is only necessary to continue in fleet what is done in this respect at training stations. It would soon become a routine duty for the sailor man, and be as well done as by the soldier. It is entirely a matter of training. The routine at training stations is given below:

5.15 a. m. Call officers on duty, bugle squad, chief of sections, and squad leaders.
5.30 " Reveille.
5.45 " Baths and scrub clothing.
6.40 " First call.
6.45 " Assembly (march to breakfast).
7.30 " Police houses, streets, and surroundings.
7.45 " First call.
7.50 " Assembly.
7.55 " Adjutant's call (first period).
8.45 " Sick call.
9.00 " Second inspection of division houses and streets, or barracks, and reports of same.
9.15 " First call.
9.20 " Assembly and inspection of men by company commanders.
9.30 " Adjutant's call (second period).
9.45 " Guard mount.
10.45 " Retreat from drill and reports to mast. Scrub clothing.
11.35 " First call.
11.40 " Assembly.
11.45 " Adjutant's call (march to dinner).
1.10 p. m. First call.
1.15 " Adjutants' call (third period).
3.00 " Retreat, scrub clothing, and recreation.
4.35 " First call.
4.40 " Assembly.
4.45 " Adjutant's call (march to supper).
5.50 " Swimming.
6.45 " First call.
6.50 " Assembly (for muster).
8.55 " First call.
9.00 " Tattoo.
9.05 " Taps.

It is found best not to compel apprentice seamen to scrub or wash clothes at any regular or routine hour, but to allow them to scrub and wash clothes at any time that does not interfere with drills and formations. The recruit knows that his bag must be ready for inspection at any time, and that clothes worn must be clean.

Oftentimes men turn out in the morning, and do not feel up to scrubbing clothes, they may not feel well, and to be obliged to scrub clothes under such circumstances, particularly when you have not been used to such a thing, is liable to make the recruit shirk cleanliness.

The general mess system is employed at training stations, and commissary stores are established.

"Ordinary Seamen from Training Stations in Fleet."

The object of the training service is to supply the fleet with fairly well trained men in the shortest possible time; to give such preliminary training at training stations as will avoid the delay in getting battleships ready for battle as would be caused if raw recruits were sent to the fleet. The present system of training has been in operation for the past five years, so that the results of the system should be apparent in fleet to-day. The writer is assured by commanding officers in fleet that these results are apparent, and that they are excellent. The training service effects the efficiency of the fleet by saving to the captain of a battleship, in getting his ship ready for battle, the time it would take this captain to raise the raw recruit to the standard attained at training stations. The fleet is part of the training system, and unless the preliminary training received by the recruits at training stations is continued in fleet the desired results (having finally able-bodied man-o-wars-men) will not be obtained.

The fleet is the best school for all concerned, from the commander-in-chief to the lowest rating of the enlisted force, and the battleship is the best training ship for recruits. If the conditions were such that 77 per cent of our men were continuous service men, the battleship in fleet would be ideal for training purposes, the few recruits then aboard ship would make the question of training and instruction a very simple one, but with about 77 per cent of our men on their first enlistment, the battle fleet becomes a training fleet, and we get no permanent results because the per-

sonnel is continually changing. We no soner make a trained man-o-wars-man than he leaves the service, and we have only to begin over again. It is so with many things in the navy. We progress to a certain stage, then, owing to present conditions, we have to begin over again. It is so with our tactical work. A flag officer brings his command to a certain stage of tactics, then leaves the fleet, another flag officer will come and begins anew with tactics. We are suffering from too frequent changes of flag officers in fleet, and too many recruits aboard our ships. We need flag officers with experience as such and continuous service enlisted men. Without these our fleet will ever be a training fleet, from the commander-in-chief down.

We know this to be a fact, but there is no systematic effort to change the condition, and I think it is because it is the business of no one in particular to do so, there is no head, no one to father reforms or changes for the better, particularly with reference to the enlisted force.

The Chief of Bureau of Navigation is unable to make changes to better conditions as far as the commissioned personnel is concerned, this requires legislation, but, with the enlisted personnel it is quite different, changes can be made and reforms instituted by changes in the regulations, but to do this it is necessary to have some one to father the subject, to study the requirements of the same, and to act (with proper authority).

At training stations every effort is made to develop the individuality of the recruit, and to impress upon him the military character of his business. Most of our recruits come from the West, middle West and lake regions, and represent, generally, a very important and intelligent class of our citizens. The pay of the enlisted force, with the possibilities of the future, makes it possible for the Navy Department, with its excellent system of recruiting, to compete successfully with civil institutions in getting our men, the question is, how after spending four years in educating the recruit, can we induce him to remain in the service.

It is for the Navy Department to thoroughly investigate the matter of the enlisted personnel, and to apply such means as will improve its condition, and it is the business of the fleet to so conduct the recruit through his first enlistment as to induce re-enlistment.

Modern wars are short, the wars of the future may be shorter.

There is no time to train recruits in time of war, the fleet must be manned by trained men to get the highest per cent of efficiency, and this can only be done by creating a large enough continuous service force, around which may revolve the comers and goers.

We find that about 77 per cent of the enlisted force are on their first enlistment, about 17 per cent on second enlistment, about 4 per cent on third enlistment, with the rest scattering. The number of our men who re-enlisted within four months of honorable discharge on continuous service certificates, in 1906, was 710, in 1907, it fell to 214, in 1908, it rose to 1150. This last increase was due chiefly to the opportunities offered by a cruise around the world, and to the bounty of $5.50 allowed for re-enlistment.

Theoretically, or on paper we have liberal and just retirement laws, but I think there are only about 50 men on the retired list after 30 years' service, and it can be shown that about two to three of these have spent the greater part of their service at shore stations. The problems of the enlisted personnel are not difficult, they need some one whose specific duty it is to look after them. The Bureau of Navigation has instituted many excellent reforms, but we need some capable officer in the Bureau of Navigation who should devote his energies, and his time to the study of the needs of the service, with reference to the enlisted force. No body of officers, or no officer, exists at the Navy Department with sufficient time, apart from his specific duties, to consider these problems or to work out any general plan for improvement, and to see that required measures are actually carried out. It is a fact that at present, the training service, and the enlisted personnel in general, is no one's particular business. The Bureau of Navigation has to do with the enlisted personnel, but it is most difficult, in fact impossible for the Chief of Bureau of Navigation to consider any detail of a policy, and the officer in charge of the office that has to do with enlisted force has not the time to handle such a matter. He is occupied with the detail of enlisted men, the recruiting service and the thousand and one details of his particular line of duty.

We have, at the Navy Department, officers with specific duties in every detail and branch of the service, excepting the enlisted personnel, and I submit that the question of creating a continuous service force is second in importance to no other question effecting the efficiency of the fleet.

Much has been written concerning the enlisted personnel, and many suggestions have been made as to how to encourage re-enlistment, how lessen the number of desertions and how improve military character, etc., but there is no head to digest these suggestions with a view to having such of them as would add to the efficiency of the service put in force. We are serving in a military professional in a non-military country, which makes it particularly difficult to deal with the enlisted men to the advantage of the service, but if we wish to create a continuous service force, we must consider the demands of the American character, and the influence that our institutions have upon the character of our men. In foreign services particularly with the great military powers, there is a class of men who are content to remain subordinate enlisted men for all their lives, this class of men is acceptable and does comprise the enlisted force of foreign navies, but such a class in the United States, if it exists, is not acceptable to our navy. We must deal with men who are intelligent, ambitious and patriotic, according to American ideas and the American standard.

Many excellent reforms have been instituted in the past few years, and have had their effect in bettering the condition of the enlisted personnel, but these reforms have not been the result of a systematic study of the needs of the service, and generally they do not effect the service, as a whole.

With 77 per cent of our men on their first enlistment, and only about 4 per cent on their third enlistment, there is evidently something wrong. It would appear that we should apply a remedy at the third enlistment, but I submit that the matter requires investigation.

Though there is much that the Bureau of Navigation can do to improve conditions, there is much that can be done aboard ships in fleet under present conditions, and the question of how to handle the ordinary seamen from training stations to get desired results, becomes a very serious one and requires immediate study by the officers of the fleet. Most of our energies is spent in fleet in hitting the target, which without a doubt is the climax of our profession, but it would add greatly to gunnery efficiency if we could retain our gun pointers instead of forever having to create new ones.

It is found that the good results of the preliminary training

received at training stations is evident in the ordinary seaman when he appears aboard the ships of the fleet, he is military in his manner and bearing, capable of taking care of his person and belongings, he is zealous and eager to learn more, he is well set up, and possesses an individuality that is the result of methods at training stations, but, after the ordinary seaman has been two or three weeks aboard a ship of the fleet, he loses his individuality or identity, and becomes simply one of the ship's company, and learns only what he can pick up from the ship's routine. The ordinary seaman finds that the standard of petty officer aboard ships of the fleet, is far below what it is at training stations, that the petty officer does not amount to as much as he was led to believe, that there is no one to keep him in the strictly *military* line of his profession, his officers are not in the same close touch with him as they were at training stations, the influence of the personal interest in his behalf, so conspicuous at training stations, has disappeared, and unless he be a very strong character, he goes to leeward in his professional ambitions, and becomes simply one of many. It is claimed by officers of the fleet, that it is impossible with so many other things to do, to look after the particular interests of the ordinary seamen, but, it is absolutely necessary, if we wish to create a continuous service force from these ordinary seamen, that our officers, particularly divisional officers, be in the closest touch with them and the individual character of each ordinary seaman should be studied by his divisional officer with a view to learning the possibilities for continuous service of each and every one. Divisional officers have in their divisions representative men, of average intelligence and physique, yet you often hear divisional officers say, this or that man is "No good"; unless the man is an incorrigible, it is the duty and business of the divisional officer to make the man good, to devote his special energies to this particular man. The commanding officer should judge the incorrigible and deal with him. Though the officers in fleet may not be able to induce re-enlistment, they should so conduct the ordinary seaman that at the end of first enlistment he would be most desirable for re-enlistment, that the ordinary seaman from training stations should advance in professional knowledge and military character, instead of deteriorating.

"Trained Men Means Fleet Efficiency."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE ENLISTED PERSONNEL.

By LIEUT.-COMMANDER T. P. MAGRUDER, U. S. Navy.

In the abundant discussions on the navy's personnel in recent years, it has appeared to the writer that these discussions, as regards the enlisted man, have been principally to formulate plans and schemes for the amelioration of his status on board ship, to increase the pay, the better food, etc.—in short, to make the service more attractive. The results, in many respects, have been entirely satisfactory.

The men are, almost without exception, well paid; the ration is generous, well cooked and properly served; the clothing is of excellent quality, well fitting and the price right. Pay is no longer withheld on account of misconduct. Liberty is granted liberally at every opportunity and furloughs of "ten days and travel time" are given to the deserving semi-annually.

Altogether the necessary restraints of naval life have been minimized as much as is consistent with the requisite discipline and efficiency. So that, upon the whole, the living conditions on board ship under which the enlisted man must serve leave little to be desired. Yet the number of men discharged for bad conduct, inaptitude and as undesirable and the number of desertions remain abnormally large; and the contentment desired does not appear to have increased adequately to the corresponding betterment in the conditions of service afloat. Why does this apparently anomalous condition exist?

An attempt to answer this question—one necessary to the fleet's fullest efficiency—and to suggest methods of ensuring a larger number in continuous service, lessening the rate of desertion and to indicate changes to better present conditions which, it is hoped, will invite discussion, is the object of this paper.

In the beginning let it be clearly understood that much herein writen has been suggested by essays in the INSTITUTE, wardroom discussions, from the views expressed by brother officers, and

that little or no claim is made to originality. Also, such expressions as "in my opinion," "it is believed," etc., will be omitted. Some of the ideas advanced will be radical and some may be—even in the writer's mind—of little or doubtful utility. Let such be subjects for discussion.

The number of enlisted men authorized by law, exclusive of prisoners sentenced to dishonorable discharge, is 44,500. Enough to man fifty *Wyoming's*. On June 30, 1909, the enlisted strength was 44,129. During the fiscal year ending July 1, 1909, 3184 deserted; 4799 were discharged by purchase, for bad conduct, inaptitude, undesirable and as unfit, etc.; 6269 were discharged, expiration of enlistment; 14,683 were enlisted for the first time. Keep these figures in mind—they are the principal cause for the writing that follows. They denote a deplorably unstable condition of the enlisted personnel. Fortunately, this condition is not necessarily a cause for undue alarm.

Upon reflection, it may be remembered that in the past ten years approximately 10,000 trained men have been discharged into civil life and that those of the artificer branches are doubtless following the trades they filled when in the service. A large percentage of these men would undoubtedly immediately volunteer their services if a war were imminent. Further, there are now in the service about 11,330 men serving under re-enlistments, and about 10,000 who have served over two years. These men together with, say, 1500 of the best marines—33,000 in all—would furnish trained crews for all the ships we have or would be likely to get. The necessity, however, for having at all times in service crews fully trained to shoot (and—as a distinguished captain aptly put it—which is more important, to be shot *at*) and ready in all respects for battle is entirely appreciated.

The importance of this readiness cannot be overestimated, and it is *the* problem that confronts the service. The question, therefore, resolves itself into ways and means of retaining *desirable* men after they have been trained to the service. Following are some of the conditions and methods whereby it is hoped this may be attained; these are discussed under several headings:

1. Pay, Food and Clothing.
2. Advantages and Privileges.
3. Discipline and Duties.
4. Early Elimination of Inapt and Unfit.

PAY, FOOD AND CLOTHING.

Pay.—The pay of chief petty officers (permanent appointment in second enlistment assumed), the average of the petty officers of the various branches, and of seamen, ordinary seamen, etc., are given to the nearest dollar in the following table:

Rate.	Pay per month.	Rate.	Pay per month.
C. P. O.	$84.00	Mess Attendants	$22-33.00
Artificers, 1st Class	55.00	P. O., 3d Class	33.00
P. O., 1st Class	44.00	Firemen	33-38.00
Artificers, 2d Class	40.00	Seamen	26.00
P. O., 2d Class	38.00	Coal Passers	24.00
Musicians	33-35.00	Ordinary Seamen	21.00
Stewards	40-66.00	Ship's Cooks	27-60.00

In addition gun pointers, gun captains, steamer coxswains, captains of hold, jacks-of-the-dust, messmen, etc., get from $5.00 to $10.00 per month extra.

A careful perusal of the above table, and taking into consideration free medical attendance and medicines, good and wholesome food and excellent clothing at a reasonable price, is convincing to a fair mind that the pay is ample and generous for the various services rendered and required. In very few trades can an apprentice have $15.00 a month, clear of all living expenses, to do with as he may. That is what an ordinary seaman can have after three or four months' service. Nor can many mechanics on shore have $40 to $50 a month to spend upon themselves, as is the case with men of corresponding positions in the service. Of course, there is lack of opportunity for advancement, except in restricted and limited lines, the restraints of life on board ship, discipline, etc., that may be assumed to be drawbacks to service in the navy—and they are, but to an extent that is usually exaggerated.

If the consolidation of all the book-keeping and clerical work on board takes place as is hereinafter suggested and advocated, the yeomen, or clerks, required should be well trained clerks and stenographers, to obtain which will necessitate an increase over the pay now given chief yeomen.

From the foregoing it may well be assumed that the pay, in general, is adequate to the services required.

Food.—One familiar with the present ration and the variety of ways in which it may be served, and the results obtained now

in the fleet, can find but little to suggest. The food as provided, cooked and served is good, clean and wholesome and is as good or better than that used in the average American family. Prohibiting the selling of cakes, pies, candies or other eatables in the ship's store, and the prevention of the excessive cigarette smoking now prevalent, will keep the appetite from being dulled and the consequent unreasonable complaints and dissatisfaction with the food.

Clothing.—The uniforms and clothing now furnished appear to be satisfactory. There have been many agitations directed against the flat cap, wide-bottomed breeches, etc. A complete canvas of the desires of the officers and men in this respect was made a year or two ago. As regards one battleship, the men were almost a unit for the retention of the present picturesque uniform. Are not frequent changes in the uniforms of both officers and men to be deplored?

A careful study of the present status of the pay, food and clothing question on the part of the writer has convinced him that none of these are responsible for desertions or the comparatively small number of re-enlistments. The causes and reasons for desertions and non-re-enlistments are as varied "as the shade by the quiv'ring aspen made." I shall endeavor to show later that a prime cause or reason is in a tolerance of the dissatisfied and inapt—particularly the latter. For it is often the unfit that cause dissatisfaction in others.

ADVANTAGES AND PRIVILEGES.

Advantages.—The benefits to be derived from enlisting in the service are obvious to one of mature judgment. To the youthful bluejacket the advantages do not appear to be sufficiently appreciated. Good pay for services performed, satisfactory food and clothing, free medical service and treatment, with full pay when ill—these can easily be understood. The great advantage in the service is the opportunity of learning a good trade, a trade that never has strikes or prohibition of employment by labor unions; certain and steady advancement dependent only upon energy, zeal and good behavior; a pension in case of disability resulting from service; six months' pay given to a beneficiary upon death while in active service; retirement after 30 years' service with generous retired pay, and best of all, perhaps, a calling that is conducive to health and fine physical development, with the

corresponding increase in the capacity for the enjoyment of life amid surroundings favorable to a normal development of the mental, moral and physical being.

Stress is sometimes laid upon the advantage to the recruit of an opportunity to see the world. This may or may not be so. It will be discussed in a succeeding paragraph.

An apprentice seaman after eight or ten years' service can be assured of promotion to a warrant officer—boatswain, gunner or machinist, provided he has the requisite energy, zeal and brains, and exhibits a proper sense of duty and determination, or, in other words, has the same qualities of mind and heart that will engender success in civil life. Twelve warrant officers may be promoted to ensign each year. So that as far as advancement is concerned, but few occupations give as great opportunities for advancement to a youth of eighteen or twenty thrown upon his own resources as does the naval service.

The opportunities for saving a large part of the wages cannot be excelled in any other trade. The ofttimes enforced restrictions, like tropical service, long cruises and stays in places where there is no incentive to spend money—all these tend to what may be termed an automatic saving. The practical results of saving are thus brought to the attention of the bluejacket, with a chance for the inculcation of the saving habit.

Privileges.—These are naturally closely related to the foregoing enumerated advantages. Visiting the large coast cities of our own country and foreign cruises should tend to a broadening of the mind and stimulate mental processes. The accretions of enlistments due to the advertising of the world cruise of the battleships would naturally cause reflection as to the desirability of having the ships make periodical cruises to the Mediterranean, the Baltic and other interesting waters. A well established routine in this respect surely would attract desirable recruits in as large numbers as needed.

The privilege of granting allotments and of making deposits upon which the government pays 4 per cent interest, are not granted in any other trade or calling. These are being taken advantage of by a large and increasing proportion of men who appreciate the advantage thereof.

The question of liberty when in port admits of a few observations and suggestions as to frequency and length tending towards satisfaction and contentment of the men. Sunday, Wednes-

day and Saturday afternoons are generally holidays on board ship. On these days the liberty party could go after dinner until the next morning. The practice of permitting the first conduct class to go every day after working hours has been advocated. This practice is objectionable for the following cogent reasons: a man after a day's work, going on liberty, is almost invariably up late at night. The next day he is tired and sleepy and his duties are apt to be done in a perfunctory manner, if not under compulsion. Frequent liberties soon absorb the monthly money and results in listlessness at drills and a poor performance of duties. One day in four is ample liberty for the deserving, provided the hours are long, and reliefs are furnished for the men on special details. Men have been known, where liberty was frequently given, to sleep on shore (perhaps at a convenient Y. M. C. A.) in order to escape turning out early for the morning watch work. I remember reading in the INSTITUTE some years ago a statement to the effect that the more men out of the ship, the easier to keep her clean. Yes; *if they stay out*. But all hands are on board during the day to make dirt, and the bulk of the cleaning must still be done in the morning watch to avoid interference with yard workmen, drills, repairs and special work. Too much liberty during the week must entail listlessness at work and drills. It also entails the making of associations frequently to the detriment of the men's health and money. Let this be emphasized. It would be advantageous to the ship and crew to give fewer liberties, with longer hours. The large majority of men prefer one 24-hour liberty to several 5 p. m. to 7 a. m. liberties.

Discharge by purchase is a privilege that may be broadened, perhaps, to advantage. A natural inclination to resist the restraints of discipline, springing from the doctrine that "All men are born free and equal," is a cause for desertion. If the homesick recruit knew he could purchase his discharge when he had saved sufficient money, he might hold on and later see the advantages accruing by his remaining and thus be saved from deserting, which he would do if no release were apparent.

DISCIPLINE AND DUTIES.

Discipline.—It is a well established fact that those ships are the happiest wherein the discipline is firm and infractions are punished promptly, evenly and adequately. To the writer it has appeared that certain offenses such as: leaving ship or duty

without permission; drunk on board ship; smuggling liquor, etc., should usually be punished by *bad conduct discharge*. A serious offense, done deliberately, betokens a spirit such that the sooner the service is rid of the individual, the better for the service. Material for training is so plentiful that it scarcely seems worth while to waste time and energy in warning those who have inherently deficient qualifications. A man who deliberately overstays his leave as much as twelve hours is a fit subject for a deck court.

A tautening of discipline cannot be done on a single ship. That would unfortunately entail unjust criticism of the captain and he would see June 30th approach with fear and trembling. An habitual liberty breaker should have no place in our service. I have seen and examined probably two thousand enlistment records in the past three years and the variation in punishments for serious offenses is truly remarkable. Of late years a tendency has developed to advocate a "free gangway," longer smoking hours, no evening quarters, etc., or, in fact, a *relaxation of military discipline* to too great an extent, if all these privileges advocated were adopted. Evening quarters a half hour before supper is, I believe, helpful to good discipline. Clearing up the decks, inspection of uniform, muster and short setting-up drill is no hardship on anyone and the advantages are obvious.

The sentence for desertion is now, happily, imprisonment with hard labor. Strict enforcement of the sentence would be a decided deterrent. Could deserters be apprehended with the same certainty and celerity as a defaulting bank teller, for instance, it would not be many years ere a decrease in desertions would be apparent. Could not some arrangement be made with the National Secret Service whereby deserters could be apprehended with promptitude and certainty?

Punishments for serious offenses can well be regulated by the various courts. For minor offenses punishments are assigned by the captain at the "mast" and are restricted by law to deprivation of liberty, confinement and extra duties. It is believed that a law authorizing the imposition of fines, say, not exceeding $5.00, would be certain of greatly reducing the number of minor offenses. Frequently reduction in conduct class is no punishment; where, for instance, it is not practicable to grant liberty; or, on the other hand, deprivation of liberty may result in a

greater punishment than is intended. Confinement always carries with it extra work for others, the duties of the offender being performed by his shipmates. Extra duties necessitate a detail of a petty officer to see the duties done. There are no valid objections to the imposition of a small fine. A police justice has that power and surely the captain of a battleship is, in every way, entirely capable of exercising the right to fine with fairness and justice.

Holding "mast" is to many a disagreeable duty. By a liberal resort to deck courts and the proposed system of fines, the number of delinquents should be greatly reduced, with a corresponding betterment in the discipline and increased contentment. Every officer has seen offenders leave the "mast" after being awarded "extra duties" or "reduction in conduct class," figuratively laughing in his sleeve. If the offender had been fined a few dollars, it would have been a real punishment. Holding "mast" regularly with dignity; omitting long lectures followed by a "warning"; awarding adequate punishments with certainty—these will deter habitual petty offenders, a class on board ship deserving little or no consideration.

Duties.—The Navy Regulations state how duties shall be performed in language that cannot be excelled for exactness, brevity and clearness. To enforce compliance with these regulations and attain desired results may appear superficially to be an easy matter. On the contrary, it is the most difficult duty that confronts the sea-going naval officers. To succeed requires a thorough, careful and conscientious study of that most complex subject *human nature,* and especially *bluejacket* nature. For the training, environment and duties of bluejackets make them differ materially from men of other callings.

If everyone on board ship did his full duty voluntarily as laid down by law, all questions of discipline, internal economy, etc., would be answered. Obviously this is not the case and direction and supervision are required. This direction and supervision is obtained ordinarily by having small groups of men under petty officers; several of these groups under an officer and all under the captain, assisted by the executive officer. I believe that there are too many small groups under petty officers and too many petty officers.

Nowadays, when nearly all boating is done by steamers and

the number of boats on a battleship are small, the large number of coxswains could be reduced, if not altogether done away with and their places taken by a lesser number of boatswain's mates 2d class. The coxswain of a steamer has independent, responsible and arduous duties and a boatswain's mate 2d class would appear to be a proper rating for that duty. A boatswain's mate 1st class and two boatswain's mates 2d class are sufficient petty officers for the ordinary division on board ship. For drills leading seamen could easily be detailed as squad leaders. This would reduce the number of "politicians," a fruitful source of discontent, and increase the number of men available for the ship's drudgery. And just here is a good place to emphasize the desirability of, if not necessity for, decreasing the number detailed for special duties. With full complements there are plenty of men for all work. There is, however, a tendency for men and officers to request "strikers" (a word developed in recent years and an abomination), which, if indulged, leads to abuses and to the condition that men of higher ratings do not perform their full duties. Blacksmith's striker, plumber's striker, turret strikers, mess strikers, gunner's mate's strikers, etc., strikers *ad libitum* and *ad nauseam* are met with in the service. These should be reduced to the few men in training for higher ratings in which there may be vacancies in the ship's complement.

The differentiation between the duties of an ordinary seaman and a seaman has in the nature of the present day service been obliterated. It would seem that promotion from ordinary seaman might well be made a reward for duties well performed for a specified time, not less than two years, after passing satisfactorily a practical examination in the duties of a seaman. And right now is the time to require petty officers of the 2d class to be continuous service men. Chief petty officers, of the seaman branch, should have at least eight years' service before receiving permanent appointments in addition to the qualifications now required by the regulations. Should this be done, it will result in slower advancement and *may* cause the immediate loss of a few men. On the other hand it will dignify the rating of petty officer; and by making the position harder to obtain, will cause it to be more eagerly sought and more gratification when obtained. A better class of petty officers will be the result with the great advantages that brings.

The reduction of the number of yeomen on board ship by a consolidation of their duties is a field wherein men and money can readily be saved. Every head of department doubtless has suffered from inexperienced yeomen. The contemplated establishment of the general storekeeper's system on board ship is an excellent step, provided it is done in such a way that the obtaining of stores by the various departments may be done promptly and efficiently. All the property returns and book-keeping can then be done by the pay department, which also could make out all requisitions. By making yeomen clerks and stenographers and paying them accordingly, enlisting them as acting chief yeomen, a good and competent class of men can be obtained. There is not enough clerical work on board ship to keep more than three or four employed. Now we have as many as ten or a dozen on each battleship. Also, the number of ship's cooks is excessive. By a simplification of the galley organization, doing away with special details *there* (such as butcher, pantryman, coffeeman, etc.), and putting the chief petty officers in the general mess, a reduction in the number of cooks may be made without decrease in quantity or quality of output. Some of the duties of cooks, such as running the dishwashing machine, the potato peeler, sausage grinder, coffee urns, etc., may well be done by extra messmen if necessary. The number of officers' stewards, cooks and mess attendants is very large. Quality is far preferable to quantity in these ratings. The Bureau of Navigation has been hard put to find and supply good servants. It has succeeded well, considering the material at hand in our country. The solution of the servant problem (as keen with us at sea as with those on shore) might be met by the use of Chinese, if in some way they could be obtained for use on our ships without violating the exclusion laws. Or, perhaps, the Filipino—now under trial—may emancipate us from our emancipated servants, a consummation heartily wished for by most officers afloat. The laundrymen (32 in the fleet) can be dispensed with, together with the costly machinery; valuable space saved and better service obtained if the supply ships each carried a *good* laundry. Barbers and Chinese laundrymen who clear anywhere from $75 to $150 monthly make some of the men envious.

A consolidation and simplification in the many ratings would, perhaps, tend to better performance of duties. There are no less than *eighty-three* separate ratings on a complement sheet.

Detailing one or two hands from each division for small jobs should be abolished. It has been done, I believe, on some ships. Each day detail a working party (a section from a division might well do) to answer all calls not necessitating many men. A bugle call should be allotted to call them to muster at a specified place ready to work. This will obviate much passing the word, delay while the detail is being made, etc.

At times sports have been given the character of duties. Is that advisable? Sports should be voluntary. Give the time and opportunity, but let sports remain *sports*. I have seen a ship forced to detail a crew to take part in a boat race. That crew didn't make a creditable showing. Voluntary sports furnish amusement and recreation. Sports under compulsion become a source of irritation and dissatisfaction. Ask the executive officers! The need of exercise is obvious. The loading (in particular) and other drills; the manual labor necessarily performed by a battleship's crew, together with a proper physical drill at morning and evening quarters, will be sufficient to make the men strong and to keep them so. The sports as now carried on train highly a few teams—the very men who do not need physical training. Discouraging or prohibiting betting on sporting events will do much to inculcate and develop a *real* sporting spirit.

A condition that may give birth to discontent, and one that must be handled with tact and judgment, is the presence on board ship of the negro in ratings other than that of the messmen branch. There is a prejudice on the part of some men against working alongside, messing with or billeting near the negro. However unreasonable or unjust this may be, it is a condition and not a theory. There are negroes in the service who are clean, sober and hardworking men; in fact, I know one negro seaman who is as honest, industrious, reliable and efficient as could be desired by the most exacting. It is also true that as a class, the negro is easily amenable to discipline. They must be enlisted when they present themselves and are eligible. That is their right. The following suggestion is made, which is one way in which this situation may be handled, viz: Man certain ships entirely with negroes with the exception of chief petty officers and petty officers of the 1st class. By this method promotion would be available to the worthy black men which is now at times impracticable. Hawaiians, Samoans and Camorros make

good seamen, and these could serve on the ships set apart for colored crews. And these ships would be peculiarly suited for tropical service. This method of dealing with this condition in our service would but follow the example of the army, which has negro regiments. The negro himself would doubtless prefer this plan to the present system, since it would give him a better chance for promotion, he would have more company of his kind and be freed from the prejudice of a few of another color who may not be his superior physically or in the qualifications for the ratings they hold.

EARLY ELIMINATION OF INAPT AND UNFIT.

The early elimination of the inapt and unfit is the best single step that can be taken to improve the discipline, lessen the desertions, add to the contentment of those remaining in the service and increase the number of re-enlistments. Some of the officers in the fleet agree that the efficiency of the ships will be materially increased by getting rid of from 5 per cent to 8 per cent of the least desirable of those serving in their first enlistment. At present the undesirables are discharged by courts-martial and by order of the Bureau of Navigation upon recommendation of the captain. To be discharged by court-martial implies *a priori* the commitment of a serious offense. Discharge by Bureau's order necessitates a recommendation to that effect by the captain based upon the delinquent's record. The Bureau, I believe, almost invariably approves the recommendation when it is properly made and warranted by a bad record. These two methods, however, rid the service only of the unfit and undesirables whose records are bad. There is, however, unfortunately another class of men who are undesirable and the elimination of whom it is the purpose of this section to show will result in the benefits noted above. That class of men composed of the lazy, stupid and shiftless; those who are colorless and mediocre; who work only when compelled and then in a half-hearted way; whose ideas are to give as little in return for their wage as possible and still remain in the service: in short, the *undesirable*. The conduct records of these will show only minor offenses. So that it is difficult, if not impracticable, for a commanding officer to recommend their discharge as undesirable, basing the recommendation on their enlistment records. It has been and it is still necessary to safeguard

the men from capriciousness and injustice. That, it is presumed, is the reason for the regulations applying to discharges.

It is suggested that a board consisting of—on large ships—the captain, the navigator and the senior medical officer (whose services may be needed in the cases exhibiting weak mentality) be authorized to meet, hear the evidence *pro* and *con* in the case of a man recommended by the executive and a division officer of the ship for discharge, and to report to the commander-in-chief or senior officer present those men recommended for discharge for inaptitude or as unfit. Should the commander-in-chief or senior officer present approve the recommendation of the board, the man to be discharged at once, if serving in first enlistment. The discharge of a continuous service man to be approved first by the Bureau of Navigation.

The personnel of the board might be different; or the order for a board of officers serving on other ships might be given by the commander-in-chief upon a request from a captain. The necessary details and regulations are immaterial if some method is available of ridding the service of the class of men under discussion with expedition and certainty. Often the willing horse is ridden too hard. The well-meaning, industrious men turn up promptly in answer to calls and they do much of the work before the laggards are driven to work. Three men answering a call, two of whom are willing hands and the third a poor worker, are not as efficient as, perhaps, the two good men. The drone affects them deleteriously. In the course of time the willing hands say (to themselves) "what's the use?" A more equitable distribution of the ship's drudgery will result, and that tends toward the satisfaction of those willing and anxious to sustain their proper share of the day's work.

The prompt and early discharge of the unfit and undesirable (this term is repeated for emphasis) will inure to the benefit of every one on board ship from the captain down to the last recruit. The time of the captain, the executive and other officers will not be taken up daily by a "mast" consisting of a long string of minor reports. The duties of the ship's police will be materially lightened and accordingly they can do their remaining duties more thoroughly. There have been instances of men suspected of the use of drugs or of unclean habits, the proofs of which were not forthcoming to enable trial by court-martial. Such

cases as these could well be handled by the suggested board. A few men will be met with occasionally who are discordant elements in a ship's company, or who are decidedly unpopular with the crew. As a belief is prevalent that captains have been retired apparently on account of unpopularity on board ship, why should not an unpopular enlisted man be discharged from the service? A most important element in this early elimination is the saving in the time and money spent on the training of worthless material. The place of the men so discharged would have to be taken by recruits, but the material for further training would undoubtedly be better. This elimination would naturally increase the self-respect and pride of service of those remaining.

Some remarks, in general, applicable to the foregoing, follow:

A handicap to the service for many years has been the semi-annual lengthy stays of the ships at the navy yards. Any limitation or restriction that can be placed upon this regrettable habit can redound only to the betterment of the discipline and efficiency of the crews. Long stays at navy yards are demoralizing to the officers as well as the men and efficiency trends downward by leaps and bounds. Now that we have more battleships than will be kept in full commission, it would appear desirable, if not essential, to replace ships in full commission requiring extensive repairs by those in first reserve. By so doing the fleet could be kept intact, barring accidents, all but four weeks in a year, with the concomitant advantages accruing from such an obviously desirable policy.*

Stability of the personnel of the various ships is greatly to be desired. This is probably even more important in the case of the men than of the officers. A man once detailed to a ship should be kept in that ship during his current enlistment, except for good and sufficient reasons. It is suggested that any transfers in a fleet should rest solely with the commander-in-chief. He might well have the authority to distribute within the fleet all drafts of men. Much paper work could be saved thereby, for the question as to what ship an available ship-fitter, or musician, or what-not shall be transferred could better be answered on the flagship than in Washington.

* This was written over a year ago. Since then orders have been issued which will make superfluous some of the suggestions in this article of which this is one.

Many vacant ratings on board ship may usually be filled from a batch of recruits. An examination of the enlistment records will generally show that the "previous trades" include painters, carpenters, machinists, clerks, etc.

Various happenings in the past ten years would lead a disinterested observer to conclude that the service spirit and action is dominated at some times by obtuse conservatism and at others by rank radicalism. Now, at the beginning of a *Dreadnought* era, is it not an opportune time to ponder and reflect over the problems confronting the service; to obtain solutions from those fitted to solve; then all hands strive for a healthful progression in every branch of an exacting profession to the end that when weighed in the balance of war the *navy* will not be found wanting?

A STUDY OF NAVAL STRATEGY.

By COMMANDER R. DAVELUY, French Navy.

Translated by PHILIP R. ALGER, U. S. Navy.

FIFTH PART.

EXAMPLES.*

*The Russo-Japanese War has not been considered under this head because it has been the subject of a special work (*La Lutte pour l'empire de la mer*), to which we refer the reader.

I.

The War of American Independence.

We shall begin by drawing a comparison between the War of American Independence and Napoleon's great strategic enterprise. We have chosen these two examples on account of the considerable development of forces that they occasioned; and, although the final result seems to be in favor of the principles that directed the war of 1778, we think that an attentive examination of the different conditions of our navy at the two periods will give quite another impression.

The War of American Independence opens with the sending of d'Estaing to America, with twelve ships carrying troops. There was urgent need of sending help to the insurgents, in order to weaken England's military strength and to oblige her to maintain an important naval force at a great distance.[179] In July took place the encounter between d'Orvilliers and Keppel off Ouessant. The action was indecisive, but it enabled the two sides to estimate their respective strengths.

In August operations began to take on the character of indecision and incoherence that they continued to have throughout the war.

D'Orvilliers, after having repaired his injuries, started out again on August 16 and established himself on a cruising ground between Cape Finisterre and Ouessant; then he returned to Brest without having either sought or met the enemy. The squadron was then broken up into small divisions that cruised in the Channel and the Gulf of Gascony until winter.

[179] A naval writer has given out the opinion that it would have been better to send d'Estaing to Brest to reinforce d'Orvilliers' squadron. But d'Estaing's departure precedes the sortie of the Brest squadron by more than three months, and it seems that it was of more importance to aid as soon as possible the American colonies so as not to run the risk of seeing them succumb, which would have enabled England to recall her troops and vessels. Moreover, we have seen that the junction, under existing conditions, was an operation difficult to bring about, and the very one that Keppel was instructed to prevent.

Thus the Navy Department fell back into its old ways; at first it pretended to intercept convoys by means of a fleet of sufficient strength not to fear an encounter; then, seeing the feeble result obtained, it sought, by means of small divisions, to cover a more extensive area of the sea. The two solutions were equally bad. So long as the French squadron remained concentrated, its action only made itself felt at the place where it was; as soon as it was divided, it lost its strength and ran the risk of being destroyed in detail. The rôle of squadrons is to fight the enemy to win command of the sea; light vessels can then, in full security, attack commerce, without prejudice to all the other advantages that flow from the suppression of the adversary's military forces.

Since France did not have sufficient strength on the coast of Europe to adopt this course, she ought to have sought another field and to have sent d'Orvilliers' vessels to the West Indies, taking every precaution to conceal their departure. She could do so without interference, since England, stripped of troops, was unable to attempt any important enterprise against our shores, and, in fact, never thought of doing so during the following years, when our vessels remained whole summers on the Spanish coast.

From the mere fact of Spain's alliance with France, England found herself, in 1779, threatened with attack in her home waters by forces double those that she could oppose to the coalition. The Allies, instead of profiting by the opportunity that offered to strike a deadly blow, gave England her sole chance of safety by pursuing two objects at the same time: the siege of Gibraltar and an invasion of England. In spite of this disjunction, d'Orvilliers could enter the Channel with seventy ships, where the English had scarcely forty. But the dispositions had been so ill taken that this immense armament dispersed without having done anything.

In the beginning of 1780, there happened to Admiral Don Juan de Langara one of those adventures to which divisions sent to cruise where merchant ships make a landfall are exposed. Having only nine ships, he was surprised by Rodney, who was going to Gibraltar with twenty-one ships to revictual that place. Only two vessels succeeded in escaping.

Though it is impossible wholly to escape the surprises that constitute one of the fortunes of war, the chances of untoward encounters at sea can nevertheless be lessened by the aid of information as to the force, position and probable objective of hostile

squadrons. But when a weak squadron is obliged to take station in a region that is in itself a center of attraction, it ought to expect to be attacked there by superior forces, because it cannot for long conceal its presence.

In the spring, twenty French vessels were sent to Cadiz, where they placed themselves under the orders of Don Luis de Cordova. This admiral made two sorties of short duration, and had the luck to capture a convoy. It was the sole use that he succeeded in making of the immense forces at his disposal. Impatient at the inaction of its vessels, the Versailles Cabinet sent Vice-Admiral d'Estaing to Cadiz, where he took command of the French squadron and brought it back to Brest.

On December 20, 1780, England declared war against Holland. The entry of the United Provinces into the coalition gave France the reinforcement of a navy less numerous than that of Spain, but much more dependable. Never had conditions appeared more favorable, and it seemed as though the campaign of 1781 ought to terminate the war. Nothing of the sort happened, and the Allies, who could have covered themselves with glory, covered themselves with shame.

Holland made war on her own account, and fought a useless battle off the Dogger-Bank. As for the sailors of the Bourbons, they again concentrated at Cadiz, and the fleet, nearly fifty vessels strong, entered the Mediterranean, whence it stood up the Channel, after having landed 14,000 men at Minorca.[180]

The situation of Derby, who commanded the English Channel Squadron, was very critical. Having returned some months before from Gibraltar (which he had revictualed without the great Cadiz fleet having thought of molesting him), he had been able to collect no more than thirty vessels. Forced to withdraw before the combined fleet, he anchored in Torbay Bay and made arrangements to fight. Upon the decision taken by the Allies depended the issue of the war. With the exception of seven ships that were operating in the North Sea under Parker,[181] Derby's fleet was the sole de-

[180] Port Mahon capitulated on February 6, 1782. It was the sole advantage gained in Europe during the five years of war. Such a result would tend to throw doubt upon the efficiency of navies, if we adopt the opinion of those who consider that the War of American Independence was a glorious period for us.

[181] Protecting convoys from the Baltic.

fence that England could oppose to an army of invasion and to the enterprises of our commerce destroyers. Would the Allies decide to fight? Until then they had been able to claim that the campaigns of 1779 and 1780 had not been favorable for an encounter; but this time the enemy was there, inferior by almost half, and he could not escape.

Then it was that the disintegrating influence of councils of war made itself felt. A leader who has confidence in his valor and his strength goes to the enemy, without following other counsels than those that honor and duty dictate to him; a timid or cowardly leader takes advice from his subordinates only to shelter himself behind them for decisions that he knows to be bad. Don Luis de Cordova, who was commander-in-chief, had recourse to this expedient. The council of war decided that it was not necessary to fight, and England was saved, without effort on her part, from the sole fact that the councils of the Allies had a majority who declared that ships of war, carrying cannon, were not made to fight. In the course of the discussion that took place on board the Spanish flagship, there was a French officer who dared to maintain the paradoxical opinion "that the allied fleets ought to turn their whole attention towards the object, easy to attain as well as important, of intercepting the British fleets returning home from the West Indies. This measure could not fail to succeed since they had command of the sea. It would be a terrible blow to England,[183] from which she would not recover during the war;" and no one was found to reply to M. de Beausset that these convoys would be intercepted so much the easier if the English squadron could not protect them; that freedom of the sea does not exist so long as the enemy occupies it; that attack upon commerce was not as efficacious a method as was claimed, since during three years it had produced no effect; that finally the terrible blow from which England could not recover was the destruction of the sole important force behind which she was taking shelter.

The combined fleet made a useless cruise of short duration in the Channel and on September 5 broke up. Guichen returned to Brest and Don Luis de Cordova took his impotent *armada* back to Cadiz.

[183] It is interesting to compare these words with the phrase of Ramatuelle that we have quoted, and with theories in present vogue.

The Dogger-Bank action was fought on August 5, at the moment when the events we have just spoken of were happening. The presence of the Dutch in the North Sea then took away from Derby seven ships, but it deprived the allied fleet of an equal number of vessels. Diversions only have a useful effect on condition that they are made with forces inferior to those they immobilize away from the principal theater of operations, and at such a distance that the return of the latter cannot alter the state of affairs.[183]

The year 1782, the last of the war, was to add still another humiliation to all those that the Allies had already suffered.

On June 4, Don Luis de Cordova left Cadiz with thirty-seven ships, of which five were French,[184] and stood northward. In the Channel he was joined by La Motte-Picquet with eight ships, and the fleet, forty-five strong, began again for the last time its useless cruising. Howe was sighted at the head of twenty-two ships; he had no difficulty in escaping. At the beginning of August, the combined fleet returned to Cadiz; on September 10, it anchored at Algeciras, where it took part in the fruitless attempt against Gibraltar that was undertaken at that time.[185] On October 11, Lord Howe appeared in the Strait, escorting an immense convoy with thirty-six ships; on the 14th he succeeded in getting his merchant ships within the shelter of the guns of the fort, before the very eyes of fifty hostile ships,[186] and left the Mediterranean, unmolested. It was the third time that England had succeeded in revictualing the Rock.

The capture of Gibraltar was the dominant care of the Spanish

[183] The efficacy of diversions is not always positive. Their object usually is to force the enemy to weaken himself in a certain region by threatening him in another; but this result can rarely be attained without being obliged to weaken oneself, and then the gain is not evident.

Operations are often called diversions that are not such. M. de Sartines' plan of campaign included four: in America, in the West Indies, in India and in the Mediterranean. Their object was to separate the English from their coasts. They were wrongly named, for these diversions absorbed almost the whole French fleet, which could no longer threaten the enemy's shores without recalling the forces detached to Spain.

[184] These vessels had been led to Cadiz by Guichen at the end of the preceding year.

[185] We allude to the attack that was to be made by land and by sea and that was interrupted by the failure of the floating batteries.

[186] The combined fleet had been reinforced by the vessels that were stationed on the spot.

government throughout the war; and the question now arises whether the method that it adopted to realize its object was the best one.

Independent of direct attacks, the Spanish proposed to reduce the place by famine. To this end they always kept considerable forces in the Strait. Well, with apparent inconsistency, Rodney, Derby and Howe revictualed Gibraltar at the precise periods when the whole Spanish fleet was concentrated at Cadiz; so that England appeared to select the least favorable moment for performing an operation that, in itself, presented serious difficulties. She could not do otherwise. As soon as the Allies appeared in the Channel, England needed all her forces to avert the danger that threatened her and she was obliged to subordinate her secondary objectives to her principal objective. As soon as the season removed from her shores all immediate danger, she reunited all her available vessels, joined to them those that were assigned to her foreign stations, and sent them to the Strait. After that only a tactical operation was required for success, and she rightly trusted in the skill of her admirals to accomplish it. There is good reason to think, therefore, that it would have been advantageous for Spain to have stationed some light vessels at Algeciras to intercept single ships, and to have joined the blockading squadron to the combined fleet when the latter went north. If England had taken advantage of this to revictual the Rock, she would have been obliged to weaken her fleet in the Channel at the moment when her shores were threatened. Furthermore, it is unnecessary to say that, if the English squadron had been destroyed in the Channel in the summer, it would not have been able to go to Gibraltar in the winter; nevertheless, this obvious proposition does not seem to have been seen by the Allies.

The events that took place in the West Indies and on the American coast had a direct reaction on the conduct of the war, since they were the determining cause of the weakness of the English in the Channel; the French government's error, therefore, was not in sending forces there, but in having wished to settle the affair in that remote region. The whole interest of the war was transferred there; and it appeared as if the capture of a small island might topple over England's power. Since circumstances favored direct action against our rival, since it was in Europe that we were the stronger and she the weaker, the key to the situation was in

Europe. What mattered it then if the English took some islands from us and we took from them some others? The two important matters in the Atlantic were first to support the war on land by furnishing the insurgents with troops and the aid of our vessels for their operations, and then to keep as great a number as possible of English vessels away from home. This result obtained, a favorable occasion should have been seized to bring the vessels sent to the West Indies across the Atlantic and to make them participate in operations in the Channel. It was easy to do, because the respective positions of the two sides were not the same. The English, engaged in a continental war that required the transport of troops by sea, and obliged to protect their West Indian possessions, did not have free disposition of their forces to the same extent that we did of ours. Moreover, the perpetual coming and going of our squadrons between the American coasts, the West Indies and the shores of France, kept up as to the movements of our forces doubts that it was easy to profit by. When d'Estaing left Boston, November 4, 1778, to go to Martinique, Howe had no knowlege of it,[187] and, even if he had had, would probably have been unable to follow him. When Guichen left the West Indies to return to France, Rodney thought he had gone to America and hastened in that direction in pursuit of him.

It therefore seems that it would have been possible, in order to strike a decisive blow, to make the return of our ships concord with operations in European waters, or even to retain in Europe the detachments intended for the colonies, after having them make a feint at departure. De Grasse got under way from Brest on March 22, 1781, with twenty-six ships, of which twenty were under his direct command. If he had returned to Europe at the beginning of May, we would have been able to get along without the help of the Spaniards, which was so fatal to us. The following year, the same de Grasse was in the West Indies; if he had been able to escape Rodney's vigilance, the latter would probably have looked for him at Jamaica, against which an expedition was

[187] At the same time that d'Estaing left Boston, a division of five ships left New York to attack St. Lucia. It was a coincidence; and we have a right to suppose that, if he had known d'Estaing's plan of going to the West Indies, Howe would not have judged it opportune to choose that moment for attacking St. Lucia. Hotham arrived before d'Estaing and took the island.

planned, and the thirty-three ships that fought the battle of Dominica would have found a more favorable field of action on the English coast. But, to carry out movements of forces of this sort, a plan was necessary; well, the Allies, after having made several for the execution of which they had neglected to prepare, lived from day to day.

The details of operations in the West Indies and in America matter little from the general point of view that we are here taking. We have already had occasion to point out the special character that they assumed in the islands. It is, therefore, enough to say that they evidenced the same faults: substitution of secondary objectives for the principal objective,[188] exaggerated respect for the enemy afloat.

The Indian campaign was equally unproductive. For two years Suffren expended treasures of energy and activity, and, in that far-off region, with very weak forces and insufficient resources, he established the true principles of warfare. Local conditions did not lend themselves to transcendent plans; Suffren's entire strategy consisted in conquering the empire of the land by that of the sea, and he employed the sole efficient means of settling the question by pursuing the hostile squadron without respite. Not to leave his prey for a single instant, he refused to quit India and, lacking a base of operations, he seized one. Unhappily he acted too far from Europe to be able to weigh upon the issue of the struggle. In fact, the preliminaries of peace, signed January 23, 1783, re-established in that region the *statu quo ante bellum,* although hostilities did not cease in India until July 8. The battle of Cuddalore was fought in the interval. This glorious campaign served only to show what the genius of one man can accomplish with imperfect means.

Looking back over the past, we see that France never had had, and has not since had, so fine an opportunity to break down for a long time the power of her rival. Since 1775 England had been exhausting herself in keeping her American colonies in subjection; in 1778 France comes to the aid of the insurgents with her troops

[188] Yet we cannot resist the desire to cite the following occurrence. D'Estaing fights a successful action against Byron, whose vessels are much damaged; content with having thus protected Grenada, he neglects to pursue him, in order to secure his new conquest. See, upon this subject, Mahan's remarks, p. 402, and Suffren's letter.

and her fleet; Spain, in 1778, and Holland, in 1781, unite with France. Thus England, still clinging to the hope of not losing her colonies, had no more troops at home, and had to make head against three navies. It was impossible for her to attempt anything important against the Allies; she could at the best only hope to maintain her position. France, on the contrary, was free to dispose of her whole army without reserve and, thanks to her allies, had numerical superiority on the sea. Was not this the moment, after having supplied the insurgents with the contingent of troops that they needed to continue the struggle and to operate a diversion, was not this the moment to strike at England's heart and to make everything converge to that end?

The Allies, on the contrary, carried on only a petty warfare. In Europe, they exhausted themselves against the wall of Gibraltar; in the West Indies, they expended their strength in small expeditions which, when successful, were immediately compensated by equivalent reverses.

The war went on thus during five years, at the cost of considerable financial sacrifices; and the most important maritime event [189] was a disaster for us.

It was the general lassitude and the crushing of the English troops in America that put an end to hostilities; so that we have a right to assert that, if England had from the very beginning made a sacrifice of her colonies, instead of using herself up to keep them, she would have made the three navies that had leagued themselves against her pay dearly for their aggression.

What then was the cause of the impotence of our squadrons, that were, nevertheless, commanded by officers of merit? As far as the execution is concerned, it must be attributed to an erroneous conception of war, and this initial fault was aggravated by a lack of understanding between the Allies which entailed disconnected efforts. Each country, with the exception of Holland, had entered the coalition with its own special object. The Americans desired their independence; the Spaniards meant to recapture Gibraltar and Minorca; France sought the revision of the disastrous treaty of 1763. The individual pretensions of the Allies were legitimate: nations do not go to war for sentimental reasons, but for gain. Their error was in believing that the best means of attaining their

[189] The battle of Dominica.

objects was by systematically prosecuting the conquest of all the points they desired and not by undertaking a common action that would have given them in block what they sought to get in detail. The Spaniards only followed us with regret; they went northward with looks turned back towards the Mediterranean.

It was the fatal determination to wish at any cost to retake Gibraltar that hampered most the movement of the allied squadrons. Mahan, in his masterly exposition, shows us how much this position weighed upon the English plans;[190] but it weighed much more upon those of the Allies. While England contented herself with revictualing the place from time to time with squadrons that at once proceeded to another destination, the Allies for four years immobilized important forces in keeping up a useless blockade; and Mahan concludes that Gibraltar was a powerful diversion in favor of England.[191]

After all, France, with the advantage of the offensive, with superiority of numbers, with a material in many respects comparable with that of England, with a body of brilliant and well-instructed officers, gained in this long and distressing war nothing but the restitution of Senegal and the little island of Tobago. It was a far cry from the hopes that accompanied the opening of hostilities. Nevertheless, in spite of all the accumulated errors, in spite of the lack of understanding between the Allies, in spite of the disconnectedness of operations, this war would have been glorious and productive for France, if her sailors had had for their sole line of conduct to seek before all else the enemy afloat and to engage him seriously each time that conditions allowed of it.

To cite only examples where the disproportion of forces made victory certain, it is easy to see that the results would have been much more important if Byron had been beaten at Grenada, Barrington at St. Lucia, Hood at St.-Kitts, Derby at Torbay.

We have not spent so much time in reviewing the War of Ameri-

[190] The importance of Gibraltar only made itself felt during wars in which England had to maintain squadrons in the Mediterranean. The squadrons went there to get supplies and to refit. As soon as circumstances forced the English vessels to evacuate the Mediterranean, Gibraltar became a burden.

[191] A surprise attack that might have taken the Rock in a few days could be understood; but there was no justification for paralyzing whole squadrons in keeping guard over a few battalions.

can Independence for the purpose of criticizing those who conducted it. At that period an action carried on with Napoleonic energy would not have been thought justifiable; but though we do not accuse individuals, it is our duty to profit by events. The lessons that they furnish will enable us eventually to demonstrate to our allies the necessity of not seeking divergent objects and of not sacrificing the general interest to special interests.

II.

Napoleon's Naval Strategy.

In 1803 Napoleon took up again the plan of invading England to which the Allies had given some thought in 1779, and we shall now see how he made all efforts converge upon a single end, impressing upon operations that unity of action which had been so completely lacking in the war of 1778. We shall likewise see with what fertility of mind he derives advantage from an unpromising situation, modifying his plans according to circumstances, and never being at a loss to utilize his forces.

The flotilla of gunboats had completed its concentration in the northern ports, and the moment was approaching when the 150,000 men collected at Boulogne would need nothing more but a free passage in order to cross the Strait. The Emperor's solicitude was then to bring to the Strait of Dover sufficient forces to drive off the English cruisers.

There were then eighteen ships at Brest, five at Rochefort, five at Ferrol, one at Cadiz, and eight at Toulon. All ports excepting Cadiz were blockaded. Nelson was off Toulon, Cornwallis off Brest.

Napoleon, who thought he could get his army across in the month of February, 1804, counted upon the winter storms to break the blockade of Brest. That squadron was then to proceed to Ireland, to land a body of troops there and to appear suddenly in the Channel. Its force was sufficient to secure freedom of the Strait for a few days.

Preparations not having been finished for the winter, all hope was lost of being able to leave Brest in the milder weather of summer, which made the hostile force more active; on the other hand, the strong mistrals that sometimes blow in the warm season forced Nelson from time to time to take refuge in lee of Corsica.

Napoleon then thought to entrust the Toulon squadron with the rôle previously assigned to that of Brest, and, with this object, he placed Latouche-Tréville at its head.

The latter was to set sail from Toulon with ten ships,[192] to steer

[192] Two vessels had been fitted out during the winter.

to the south so as to deceive the English cruisers, then to stand for the Strait of Gibraltar, to pick up the ship *Aigle* at Cadiz in passing, to unblock the Rochefort division and to enter the Channel with sixteen ships.

To mislead Nelson as to the true destination of the squadron, a camp was established near Toulon, the troops of which were officially destined to go to the Levant.

Meanwhile Ganteaume would keep the squadron blockading Brest occupied by feigned sorties. If Cornwallis, nevertheless, received information of Latouche-Tréville's passage and hastened to pursue him, Ganteaume was to go out; and one or the other of the two squadrons, perhaps both, would be able to get into the Channel.

The death of Latouche-Tréville prevented the execution of this plan. Villeneuve took command of the Toulon squadron, while Missiessy replaced Villeneuve at Rochefort.

All these changes had taken time, and there was no longer hope of doing anything that year.

For the third time Napoleon modified his plans. Villeneuve's character appearing to him not to be sufficiently resolute, he returned to his first idea of entrusting the principal rôle to the Brest squadron, under Ganteaume's command. The approach of winter, moreover, drew attention to the north.

Villeneuve and Missiessy were to set out from Toulon and Rochefort, to make a junction in the West Indies, to do what harm they could to the English colonies, and then to return together to Rochefort when their sortie had drawn the English squadrons in their pursuit. On their return they had orders to unblock Ferrol and to join to themselves the French vessels that were there. Ganteaume, setting out from Brest last, was to throw a body of troops into Ireland and then to go to Boulogne, either directly or by the north of Scotland.

Missiessy, in fact, set sail on January 11, 1805, and Villeneuve on January 18; but ten days later the latter, damaged by the storm that had facilitated his exit, was back again at Toulon and asked two months to make repairs.

In the meantime Spain declared war against England, and Napoleon, wishing to profit by the reinforcement given him by the Spanish Navy, enlarged still further the scope of his combinations. He wished to bring about in the West Indies a general concentration of all the allied forces and to bring this enormous

mass into the Channel, while the English, misled by the rumor that had begun to spread of a great expedition to India, uncertain as to the true destination of all these squadrons starting from all points at once, would scatter to the Orient, to India and to the West Indies.

To put into execution this gigantic scheme, Villeneuve was to set out from Toulon on the first favorable occasion, to pick up off Cadiz Admiral Gravina's six or seven ships, as well as the *Aigle*, and to proceed to Martinique. There he would form junction with Missiessy, who was already there, and would await the arrival of Ganteaume. The latter would set out from Brest with twenty-one ships and would unblock the Ferrol French-Spanish division in passing. There would thus be fifty or sixty ships brought together in the West Indies. All precautions were taken to insure secrecy. Villeneuve and Ganteaume alone received instructions from the Emperor, which they were not to open until at sea, and which they were forbidden to communicate to their captains. As for the Spaniards, they had to be content to go where they were led. Finally, Napoleon himself went to Italy, in order to take away from the Admiralty any immediate cause for anxiety.

As is known, the first part of the program was carried out without hindrance. Villeneuve set out from Toulon on March 29, 1805, joined Admiral Gravina at Cadiz, and the combined squadron steered for the West Indies. Already the presence of Missiessy had drawn the attention of the English in that direction, and they had set about reinforcing the two single ships that were there. But Missiessy awaited in vain the arrival of Villeneuve; after having made numerous prizes, destroyed the fortifications of Dominica and St. Christopher, and thrown 500 men into the stronghold of San Domingo, he had returned to Rochefort without being interfered with. This mischance was not serious, since the Rochefort division only consisted of five ships. What was more serious was that Ganteaume did not succeed in getting out of Brest: by a sort of fatality the weather continued fine, making any attempt at evasion impossible. All hope of a concentration in the West Indies, where Villeneuve could not stay indefinitely, very soon had to be given up. Napoleon then made his plan over again once more. At first he thought of making Villeneuve come directly from the West Indies to the Strait of Dover, going by the

north of Scotland. Cornwallis kept off Brest by Ganteaume, and Calder held off Ferrol by the French-Spanish division, Villeneuve's twenty ships ought to suffice to secure the Grand Army's passage of the Strait. But Napoleon thought to increase his chances of success by having Villeneuve joined by the Ferrol and Rochefort vessels (the latter having returned from the West Indies), and he finally decided on the following plan: Ganteaume was ordered to wait to be unblocked by Villeneuve before going out; the latter, leaving the West Indies, would touch at Ferrol to free the five French and seven Spanish vessels that Calder was watching; then he would appear off Brest, after having picked up in passing the five Rochefort ships; Ganteaume, freed, would join the allied squadron, which, fifty-six ships strong, would enter the Channel.

These new arrangements were communicated to Villeneuve by Rear-Admiral Magon, who left Rochefort on May 2 with two ships. Villeneuve at once set sail for Europe (June 10), happy at escaping the English squadron whose arrival had just been announced to him: it was Nelson's squadron.

"Informed by his frigates of Villeneuve's departure, this gallant seaman had waited for him several days between Sardinia and the African coast; his anxiety was so much the greater because a convoy of troops that had left England for the Mediterranean might be intercepted by our ships. As soon as he had been undeceived as to the route the latter had taken, he proceeded to Gibraltar, learned there of Villeneuve's departure for the West Indies, and with one of the finest impulses that marked his career, without hesitation hastened in his pursuit."[138] Nelson anchored on June 4 in the Barbados, picked up two of Rear-Admiral Cochrane's ships there, and went to Trinidad, where he expected to find the combined fleet. Deceived in his hopes, he set sail for Antigua. Informed, on June 12, of Villeneuve's departure for Europe, convinced moreover that the latter was returning to the Mediterranean, he hastened to Gibraltar. Arriving at that anchorage on July 18, Nelson was much astonished to learn that no French ships had passed through the Strait. Soon apprised of the route followed by our fleet, he went towards the Island of Oues-

[138] Nelson left Lagos, where he filled up with water, on the very day that Villeneuve arrived in the West Indies.

sant, left nine ships with Admiral Cornwallis, who was blockading Brest, and returned to England." [194]

Villeneuve's progress was so slow that the brig *Curieux*, sent by Nelson to England, met the allied fleet at sea; on July 8 the Admiralty was warned of his return to European waters. Still ignorant of his destination, the Admiralty contented itself with reinforcing its blockading squadrons; but all it could do in that line was to raise Cornwallis' forces to twenty-four ships and Calder's to fifteen, by the addition of the division that was cruising off the Straits. It was this squadron of Calder's that Villeneuve came upon in the vicinity of Cape Finisterre. He lost two ships in the action, and the wind took him to Vigo, where he anchored on July 28. He set out again on the 31st, and on August 2 reached La Corogne, where he joined forces with eleven vessels that he found there.

There he received the Emperor's last instructions, which urged him to betake himself to Brest.

Thus, in spite of an unfortunate battle, in spite of a slowness of progress that enabled the English Admiralty to forsee the danger, Napoleon's previsions were realized, and all that was left to do was for the allied fleet to appear before Brest to free Ganteaume. Supposing it should meet Cornwallis before reaching Brest and be crushed in spite of its numerical superiority, Ganteaume would remain untouched and could enter the Channel with twenty-one ships.

On August 14, Villeneuve left Ferrol. What was the situation of the hostile forces on this date?

On that very day Nelson had just rejoined Cornwallis and immediately went to Portsmouth, where he arrived on the 18th; Calder, for his part, joined his chief off Brest with his damaged division. Cornwallis thus had thirty-five ships, which he at once divided into two parts; one fleet of seventeen vessels remained with him before Brest; another, of eighteen vessels, under Calder, stood for Ferrol, but only arrived there after the departure of the Allies. Therefore, if Villeneuve had continued his route towards Brest, he would have met Allemand, who had the sea free since Calder had been reinforced, on the way, and would have fallen

[194] *Essai historique sur la stratégie et la tactique des flottes modernes*, by Chabaud-Arnault.

upon Cornwallis with thirty-four ships against seventeen. England would then only have had the eighteen ships of Calder that were in the south as a serious force to meet sixty ships of the Allies. Never had an admiral so fine a chance of carrying off an easy success. Yet it was at this moment that Villeneuve despaired of the Emperor's fortune: he stood for Cadiz, where he arrived on August 20.

Thus failed the greatest strategic enterprise that was ever attempted on the sea.

Ought we to conclude from Villeneuve's retreat that the Emperor's plans were ill conceived or that they were badly executed?

Yes, all Napoleon's naval conceptions were tainted with an initial defect that in advance made them unfruitful: the allied ships were not fit to make war with. Strategy, let us not forget, is only one of the factors of war; it is powerless if it is not completed by tactics, which permits profiting from the advantages that strategy prepares, and by the organization of naval forces, thanks to which a vessel or a collection of vessels can meet the requirements of war. So far as equality of numbers does not procure equality of strength, war becomes an insoluble problem; numerical superiority is no longer anything but a deceptive screen masking the abyss. Well, the action of Cape Finisterre, and still more that of Trafalgar, which was fought a few months later, proved that the allied fleet was but an inert mass, capable of receiving blows, incapable of giving them. The whole campaign was interfered with by the defective outfitting of the ships, and especially of the Spanish ships; to such an extent that it seems as if Villeneuve's unhappy squadron was only sustained by the tenacious will of Napoleon, who from the continent urges it on and directs it despite itself. Only at the end does the invisible bond that unites Villeneuve to his master finish by breaking, and the admiral gives himself up to discouragement, the forced consequence of the deplorable state of his ships.

It was the disorganized state of our naval service that occasioned damages after every storm and forced Villeneuve to return to Toulon; it was that that retarded the progress of the squadron; it was that that engendered sickness; it was that above all that created an unhealthy fear of meeting the enemy, however weak numerically he might be, and prevented Villeneuve from retaking from Calder two of his ships.

The English Navy, at this epoch, had just undergone a transformation analogous to that which the Revolution had stamped upon our armies and which was the origin of Napoleon's prodigious successes. War had taken on a harsh character such as it had not had for a long time: a struggle for existence had replaced struggles for power and for dynasties. Operations were no longer suspended during the bad season; it was necessary to keep the squadrons constantly fitted out and to make them keep the sea winter and summer, without rest or let-up. This new situation demanded a radical change in the conditions of cruising. England understood this. Hygiene, so defective on board ship, was improved by a series of effective measures, while long cruises trained crews and developed the readiness of officers to an extent until then unknown. Cornwallis could thus blockade Brest during whole years without interruption, and Nelson could accomplish those gigantic raids that would have appeared impossible a few years before. During this time, our ships, immobilized in port, wasted away in an inaction that did not make clear the necessity of no longer relying upon those hap-hazard crews and improvised armaments which had managed to be sufficient in the period when fleets left harbor to fight and returned immediately afterward.[146] Under Louis XVI, a French ship was as good as an English ship; twenty years later the French Navy could not stand up against the English forces. All the more must we be crushed when incapable captains had been substituted for our experienced officers, when sailors were replaced by soldiers, when ships were rushed to sea with incomplete equipments and worn-out rigging.

Napoleon's plan, therefore, made default in the means of execution; but, from an abstract point of view, it seems to us that it was correct in its conception. Perhaps the Emperor will be reproached with having given such a development to his plans that concordance in the movements of the different forces was difficult to obtain. But this reproach does not apply to the last form that

[146] It was one of the errors of the time to imagine that the English wore themselves out in keeping the sea, while our material remained in good condition in port. The English ships wore themselves out in the fashion of the Emperor's veterans, who swept over all the battle-fields of Europe. The inactive ships were for the French a new tool that they did not know how to use. This same idea is actually to be found in the minds of many people to-day.

the operation took, since all the Atlantic detachments were to wait to be successively unblocked, and since they were near enough together to be reached by orders regulating their movements.

To justify the Emperor's orders, it would be easy to say that, if such or such a circumstance had not come to pass, all would have happened as provided. It can be said, for example, that if Villeneuve had not had to return to Toulon, he would have found Missiessy in the West Indies, or even, if the *Curieux* had not reached Europe before Villeneuve, Calder would have had only nine ships off Ferrol, and so forth. This manner of judging things would wholly warp the lessons of history: accidents of the sea are factors that ought to be taken account of, and it is necessary always to make proper allowance for them. It is precisely because Villeneuve's situation was never compromised (as far as the relation of forces is concerned) and was even particularly brilliant at the moment when he gave up in despair, in spite of a succession of mischances that better organized forces would have escaped; it is for that reason that we have a right to say that there never was an operation better conceived.

As soon as the Toulon squadron cleared the Strait of Gibraltar, all immediate danger disappeared: the junction with Gravina gave Villeneuve numerical superiority, and he kept it to the end, because in his progress he was reinforced by the detachments from Ferrol and Rochefort before meeting Cornwallis, whose forces constituted the principal hostile fleet. The sole critical moment was the passage through the Mediterranean to Cadiz; after that the operation rested on a firm foundation, strength, the only basis for the tranquillity of mind necessary to a chief to assure success. Unhappily, the state of his ships took away all assurance from Villeneuve and confused all his faculties.

It is noteworthy that England never kept off Boulogne but a very small number of ships (four), and this manner of acting appears to have been reasonable. If the flotilla proposed to cross without the support of a squadron, light vessels would be enough to destroy it. The true danger lay in our ships of the line, and the most efficacious way of preventing them from doing any harm was to blockade them in their harbors or to follow them if they came out. England did not have sufficient forces to concentrate ships in the Strait of Dover, to watch our squadrons and to protect her colonies. The event proved that the distribution of the English

forces did not exclude all danger; but, in the critical situation in which the threat of invasion and the necessity of protecting her colonies placed England, any other solution would have been more dangerous.

We ought also to bear in mind the perturbation that the evasion of ten French ships produced in the English squadrons. The apprehensions of Calder off Ferrol, the conjectures of Collingwood at Gibraltar, Nelson's despair on his return to Portsmouth, must be recalled in order to form a correct idea of the influence of Napoleon's strategic operation.

III.

The American Civil War.

We have no intention of here passing in review the long series of attacks upon the coast that distinguished the War of Secession; moreover, though the details of all these operations cannot be too minutely studied by the tactician, who will find in them an inexhaustible mine of information, from the point of view of strategy this enumeration would be of no utility. The important thing is to examine into causes, not to describe effects.

The War of Secession is remarkable in this respect—it shows in striking fashion the impotence of a passive naval defence.

The two adversaries had a common land frontier; but by reason of a grouping of the population around a few centers far removed from one another, by reason likewise of geographic conditions, the sea was the most practicable and the shortest road by which the belligerents could meet. In consequence, the war must have begun with a contest on the sea, having as its object the command of the means of communication, if the two sides had had navies capable of fighting for control of the sea; but the federals alone had sea-going vessels, while the confederates had only gunboats and monitors lacking radius of action, unseaworthy, and whose action only made itself felt at river mouths and inside bays.

The sea was therefore free for the federals, to whom, on this account, the offensive part belonged; the confederates were reduced to keeping on the defensive and waiting for the attack to define itself. The latter's situation was very disadvantageous. They had to defend a considerable extent of coast, and the difficulty of communications by land left each of the Confederate States to its own resources, as an island would have been. The federals, on the contrary, masters of the sea, were at liberty to choose their objective and to concentrate on a single point sufficient forces to overcome all resistance. Under these conditions, the issue of the struggle could not be doubtful: the confederates must succumb. Their heroism might retard the moment of their fall; it could neither prevent it nor change the aspect of affairs.

In fact, the federals overthrew in succession all the confederates' defences by accumulating at each point forces immensely superior

to those that they knew would be met there, and by proceeding methodically, at the most convenient time, under the most favorable conditions. In vain did the confederates accumulate torpedoes, monitors, batteries; nothing availed, because there is a limit beyond which numbers always win.

Let it be supposed now that the confederates, instead of monitors of small radius of action and incapable of going to sea, had possessed a sea-going navy the units of which had the necessary qualities to move about and to concentrate: the situation would have been different. The sea would no longer have been free; consequently the Northern States would have had to renounce installing the commercial blockade which was their first act and which took away from the Southern States the greater part of their resources. Before attacking the coasts and undertaking that series of operations which made the principal confederate places fall one by one, the federals would first have been obliged to destroy the Southern Navy, which would have been able, even though inferior in numbers, to interrupt all the combined attacks and to inflict serious losses upon the federals. It suffices to call to mind the considerable time that the federals required to destroy the sea-coast defences, to become aware that operations of this sort are not possible so long as there is a mobile force in the vicinity. No doubt, if the sea-going navy of the confederates had been numerically inferior, it would have had to succumb, and the coasts would have been left open to attack. But in all ways their situation would have been better. In the first place we know (see the discussion of the "fleet in being") that a mobile force, even inferior, can paralyze superior forces; in the second place, inferiority makes itself less felt when one's forces can be concentrated than when they are distributed in small bodies; for, in one case as in the other, the enemy can always appear with the whole of his forces; finally, the Confederate Navy would not have been destroyed at a single blow without inflicting serious losses upon the federals (which would have permitted the Southern States to retard the attacks upon the coast and to augment their resources), whereas, with its fleet of monitors, the Southern Navy was incapable of preventing a single attack. From the naval point of view it may be said that this fleet played no part at all; and the federals, being free to attack at their convenience and making their expeditions at intervals, could repair their losses according as they occurred.

In short, what the confederates lacked was a sea-going navy, capable of disputing command of the sea; for upon that command depended the protection of their seacoast. That is the true lesson to be derived from the War of Secession.

Very well, this lesson has not been understood. To be sure, it is not the first time that false conclusions have been drawn from a war. This one, which ought to have caused the disappearance of monitors, whose impotence had been manifest, on the contrary only increased their vogue. All the powers set to work building them, in imitation of the United States. People said that they had been unable to defend the coast because they were too small and too few in number; and so they built bigger ones and more of them. But vessels built for offence also grew larger and conditions remained unchanged. It needed the war with Spain to disgust the United States with monitors and to make them perceive their error.

This error arose from the preponderance accorded by all maritime powers, except England perhaps, to the tactical element over the strategic element. In fact, if you will consider only the operation in itself—the attack upon a point on the coast—the more means the defence has the better the chance of repelling the attack; and as a means of defence the monitor is not negligible: therefore, they must be multiplied. The problem of defence as thus laid down is insoluble because it is impossible to collect at each important point of a coast naval defences capable of resisting the totality of the enemy's forces. It is therefore necessary to look at things from a higher view-point; that is to say, from the strategical point of view. Totally different conclusions are then arrived at. Instead of awaiting the enemy in port with forces scattered over the whole extent of the seacoast, one is led to seeking him on the sea; instead of dispersing, one endeavors to concentrate; in place of monitors, sea-going vessels are desired.

Up to the present time the naval passive defensive has not yet been wholly renounced, and most nations make two divisions of their forces: one which is supported by fixed defences, the other which acts at sea. This bastard solution has no other effect than to diminish the strength of all the forces devoted to the passive defence as well as of those devoted to the active defence, so that both are compromised.

IV.

The War between Chile and Peru.

When we read history, we look above all for facts; our whole interest is concentrated on the important events whose recital causes a dramatic emotion. The reading over, there remain in the reader's mind only the names of battles, and, if he seeks to form an opinion, it will be influenced by those episodes that are written in large letters. Well, in a war, battle itself is only a conclusion; what is as important as the battle is the manner in which it was made ready for and the causes that have determined the victory. In order to apply himself to this search the critic is obliged to look more closely into things, and he then perceives that the events that occupy the most space are not always those that have had the most influence.

For example, in the war between Chile and Peru, we cannot help being struck by the *tours de force* that the Chilean Army had to accomplish to reach Lima across the deserts; we recall the names of the battles of Dolorès, Tarapaca, Los Angeles, Tacna, Arica, Chorrillos and Miraflores; and we are tempted to conclude that it was the Chilean Army that decided the victory for Chile and that the war was above all a land war.

Well, this war was, above all, naval, because victory must inevitably belong to the side that remained in command of the sea. From the geographical point of view there is a striking similarity between this war and that of Secession.

Peru and Chile are separated by immense deserts; the two countries have no means of communication except by the sea, and the provinces, as well of Chile as of Peru, are equally without means of intercommunication, all the railroads being perpendicular to the coast; they are abandoned to themselves, they are unable to lend support to one another. Therefore, that one of the two adversaries who is master of the sea can concentrate and attack in mass, while the other will have his forces scattered without their being able to unite: the latter will necessarily be vanquished.

It was the Chileans who had command of the sea, and they then carried their army from Chile to Lima in three successive bounds: First, from Valparaiso to Antofagasta; second, from Antofagasta to Pisagua; third, from Arica to Curayaco.

Each of these bounds was across the sea and could not be otherwise: for, although the Chilean Army traversed only relatively short distances over land, the difficulties of its marches reached the limits of human endurance.

If the Chileans had not had a navy, they would doubtless have been able to land troops at Antofagasta with merchant ships, as they did, since this operation took place in full peace and Bolivia had no vessels with which to prevent it; but they would not have been able to go any further.

Inversely, if Peru had been supreme on the sea, she would have protected her territory without having need of a single soldier; for it was only after the capture of the *Huascar,* succeeding to the loss of the *Independencia,* that the Chileans dared to enter upon Peruvian territory.[195]

It was, therefore, truly upon its navy that the destinies of each country depended.

Let us now see how Chile won command of the sea.

At the beginning of the war, the naval forces of the two adversaries were sensibly equal. Two small armored vessels form the basis of each navy—for the Chileans, the *Blanco-Encalada* and *Cochrane;* for the Peruvians, the *Independencia* and *Huascar.* The two Chilean armorclads are similar, and their strength is midway between that of the *Independencia* and the *Huascar.* Each nation also possesses a few wooden ships without military value, and Peru has besides two small armored coast-guard vessels that cannot go to sea.

A little after the opening of hostilities the two Peruvian armorclads attack off Iquiqui two wooden vessels, the corvette *Esmeralda* and the gunboat *Covadonga,* which had imprudently been left on blockade off that port. The *Huascar* sinks the corvette by ramming her; the *Independencia,* the strongest vessel of either navy, in pursuing the gunboat, is stupidly run upon the rocks and lost.

Thenc[illegible]th the *Huascar* remains alone and, forced to avoid any encounter, has to be satisfied with hindering the enemy's operations during four months by disquieting his coast. She made a few lucky strokes, but finally was forced to fight and had to

[195] It is for this reason that Peru's first care after the war should have been to reorganize her navy, whereas she devoted her resources to the army.

surrender. The Chileans then remain uncontested masters of the sea and begin to transport their army. Such are the simple facts.

The brilliant manner in which, for four months, the *Huascar* baffled the enemy's efforts, and her heroic end, were the cause of her dominating the whole naval part of the war and made her capture appear its most important event. But nothing of the sort is true. The gravest event of this war was the loss of the *Independencia*. Through this occurrence, command of the sea, until then contested, passed over to the Chileans and, except by a miracle, the final victory must be theirs. The commander of that vessel, in running her on the rocks by an error in navigation, caused his country's ruin.[197]

Thereafter the *Huascar's* fate is sealed: it is only a question of time, unless she destroys herself or shuts herself up in port. Certainly, so long as she keeps the sea, her presence influences events. The Chileans are as yet only at Antofagasta, as in the first days of the war; they dare not adventure their troops at sea since one transport has been captured, and, if the Peruvians had been able to profit by this respite to put in line new naval units, the *Huascar* might have saved the day. But, under the conditions in which Peru finds herself, she does nothing more than delay an inevitable result, since the situation does not change. She prevents the enemy from doing harm for the time being, but herself does none, because solicitude for her own preservation forces her to act cautiously: she plays a negative part. Therefore, the services rendered by the *Huascar* must not be exaggerated. She did what she could, but she could do but little.

Peru had two small armored coast-guards that played no serious part because, to make them useful, they would have had to go to sea and move about. If, in the place of these cripples, Peru had had a single mobile vessel, though only of the strength of the *Huascar*, which was but a very small ship, she would have won supremacy on the sea from the beginning of the war, and this fact alone might have modified the conduct of the Chileans and made them more circumspect; in that case the loss of the *Independencia* would not have been irreparable. As a matter of fact, Peru had more ships than Chile, but the useful part of her fleet was not superior to that of her opponent.

[197] There is a lesson here for those who assert that seamanship is a secondary quality in the navies of to-day.

V.

The Spanish-American War.

Too frequent allusions have been made to this war in the course of our study to make it necessary to dwell at length upon the particular lessons that derive from it. We shall, therefore, content ourselves with speaking of it from the point of view of the general conduct of operations.

If ever a war might have been foreseen and discounted in advance, it is truly this one. And yet it took Spain unawares. It happened as it so frequently does that the nation that did not wish war, because it saw no means of carrying it on successfully, persuaded itself that war would not break out and neglected to make ready for it. When the Spanish government was driven to a rupture, it was still ignorant of what to do with its forces.

It is true that the situation, for Spain, was really not a promising one. She was about to find herself threatened at both extremities of her colonial empire, in Cuba and in the Philippines; and these two colonies were in full revolt. In the Philippines, the naval forces at Admiral Montojo's disposal were not equal to contending with Commodore Dewey's modern cruisers; and the army had too much difficulty in holding the insurgents in check to be able to pretend to repel a landing. In the West Indies, Spain had only small vessels charged with police duties; the United States was mistress of the sea. It was therefore going to be necessary to bring into this far-removed theater a squadron capable of reconquering command of the sea, in order to prevent the Americans from landing and to re-establish communications with the mother country. But the two most powerful units of the fleet, the *Pelayo* and the *Carlos V*, were not ready for sea.

In short, a geographical situation clearly unfavorable; a marked naval inferiority.

Spain held but a single trump: the immense army of occupation that she maintained in Cuba and that seemed capable of withstanding the American attempts at disembarkation. But it was necessary for this army to be fed with fresh troops and supplies,

and the sea was the sole way of communication. As in all colonial wars, the sea was to play a preponderating part.

* * *

The first encounter took place in the Philippines. On April 30, 1898, the Far Eastern American division, under the command of Commodore Dewey, appeared off the coast of the Island of Luzon: the following day it destroyed the Spanish division anchored at Cavite under the feeble protection of two batteries of two guns each. Commodore Dewey covered himself with glory cheaply; but it cannot be denied that he showed a spirit of decision that reveals in him the qualities of the true warrior.

Perhaps Subig Bay would have afforded the Spanish vessels a more favorable position than Cavite for awaiting the enemy; its approach was easy to defend and torpedoes could be moored in the entrance. What is certain is that Admiral Montojo went to establish himself there as soon as war was declared; afterwards he returned to Cavite. If it be true, as has been asserted, that the Spanish division was recalled in order to cover Manila more effectively, this order was unfortunate. Commodore Dewey had and could have no other objective than the Spanish ships; the proof of it is that he appeared first of all off Subig and only after making sure of the absence of hostile vessels went on to Manila Bay. If then—which we do not know about—Subig Bay offered advantages from a defensive point of view, the Spanish division should have waited for the enemy there and not at Cavite. Since the appearance of American ships off Manila was what was feared, they would be kept away much more surely by sending away the Spanish division which was the object of the enemy's pursuit.

Commodore Dewey was not accompanied by a landing force. His undertakings against the land must therefore be limited to the bombardment of Manila and Cavite. For that, he had first to get rid of the Spanish division. If he could not destroy it at Subig, he was obliged to blockade it there; but he did not dispose of sufficient forces to carry on at once a blockade and an attack upon shore batteries. Even if it had been otherwise, he would have hesitated to expend his ammunition against breastworks so long as the enemy afloat had not been destroyed. Therefore, as long as the Spanish vessels were afloat, they protected Manila and

Cavite; the one thing of importance was to place them where they had the best chance of resisting the enemy's attack.

The Spanish authorities would doubtless have reasoned in this manner if they had been cool. But weakness is a poor counsellor; as it scarcely permits finding an absolutely satisfactory solution, it engenders indecision and provokes changes in resolutions. In war the weaker is like a sick man who thinks to find relief by constantly changing position.

After the destruction of the Spanish division, the operations have no further interest from a naval point of view. The Americans, protected by the insurgents who were besieging Manila, occupied Cavite arsenal and established a blockade of Manila while awaiting the arrival of an expeditionary corps. The latter arrived during the month of July in successive detachments. On August 13, the place, attacked by land and sea, capitulated.

* * *

It was in the West Indies that the decisive part was to be played.

As soon as diplomatic relations were broken, the United States established a commercial blockade of a part of the Cuban coast. At this moment, the only squadron at Spain's disposal in the Atlantic was at the Cape de Verde Islands, waiting orders. It was composed of four armored cruisers and three torpedo destroyers, under the command of Rear-Admiral Cervera.

If this squadron crossed the Atlantic, it would sooner or later run against much superior forces and would have no other alternatives than either to let itself be beaten or to shut itself up in port. The Spanish government well knew that the effective strength of the squadron was much less than its apparent strength. It was incompletely equipped, and the *Cristobal-Colon* lacked her heavy guns. It was necessary, therefore, to wait until it could be reinforced by the *Pelayo* and the *Carlos V*. Meanwhile, what could happen? Before thinking of conquering Cuba, the United States, which had no army, would have to begin by forming an expeditionary corps, an operation that could not be carried out in a few days. That done, they would hesitate to risk the expedition at sea before being sure as to the Spanish squadron, which might come inopportunely to interfere with the operations of landing. Still, the Americans, who are not timid people, might attempt the

enterprise; and then it could be hoped that Marshal Blanco, having an immense army at his disposition, would be able to prevent the army of invasion from advancing until communications with the home country had been re-established by the arrival of the squadron.

The Spanish government ought to have speculated upon this situation to delay Admiral Cervera's departure. Such a determination did not imply the immobility of the squadron at the Cape de Verde Islands; it should have been caused to make a feigned departure and to leave the public in ignorance of its movements as long as possible. So long as the Americans did not know what to expect from it, they would hesitate to play their big trump card. Thus time would have been gained.

Without due consideration, Admiral Cervera was made to depart. He set sail from the Cape de Verde Islands for the West Indies on April 29. It would be interesting to know the details of his orders. I understand very well that he was directed to go to the West Indies and preferably to Havana. But afterwards, what was he expected to do?

* * *

As soon as it became aware of the departure of the Spanish squadron, the American government's solicitude must be to concentrate all its fighting ships and to await the event. It would thus be in shape to oppose the enemy. As Admiral Cervera must be irresistibly drawn towards the Spanish possessions, where his only bases of operations and supply were to be found; and as, on the other hand, it was important to support the fleet of light vessels that were carrying on the blockade, the main body should take position in the south.

If Admiral Cervera set these previsions at naught by appearing off the American coast, the situation would in no wise be compromised thereby. Threatened with being cut off from the Spanish West Indies, he would not delay making demonstrations; and all the ammunition of his four cruisers could not put in peril the fortunes of the United States.

Well, in an attack of nerves that is surprising on the part of a phlegmatic people, the American government, instead of concentrating its forces, divided them into three sections, while thirteen old monitors were distributed in the ports. In truth, Admiral

Cervera was solicitous of quite other things than seeking to meet the enemy; it is none the less true that an unhoped-for chance of success was thus offered him. And this curious spectacle was afforded: while the people of the American seacoast were trembling at the thought of seeing the Spanish squadron appear, the latter was in fear of not being able to arrive without hindrance in a well defended harbor; its thoughts were very far from the American coast.

Thus neither of the belligerents followed the line of conduct that would appear the most reasonable.

* * *

Steaming at economical speed, Admiral Cervera entered Santiago on May 23, without having had any unlucky encounter. It is curious that this arrival was considered by public opinion and by the Spanish government to be a success for Spain; and nothing shows better what a false idea the public has of naval war. Yet it was neither a success nor a failure; it was merely an occurrence that was favorable to the United States. In fact, the latter had no fear of a contest with the Spanish squadron. What troubled them was not knowing its position; so that they might fear seeing it come unexpectedly to interrupt the blockading operations and the plans of invasion. The arrival of Cervera at Santiago put an end to this provoking uncertainty. Thus, from this moment, the American government recovered itself. Further errors of execution may be pointed out, but there will be no more faults of conception. The naval forces are concentrated under the command of Admiral Sampson, who blockades Cervera at Santiago. It is decided to land the expeditionary force in the vicinity of Santiago. A double result will thus be obtained: on the one hand, the forces that blockade Santiago will serve at the same time as a protection against a possible sortie of the Spanish squadron during the landing operations; on the other hand, the capture of the heights that dominate the city will force the hostile ships to leave their refuge. All this is very good.

In the Spanish squadron, less resolution is shown. The vessels entered Santiago on May 23; not until the 31st do the first hostile ships make their appearance off the bay. In the interval it certainly seems as if Admiral Cervera had time enough to supply his ships and leave the port. It was not doubtful that the prime

necessity was not to let himself be blockaded and to put to sea again without leaving any traces. In the squadron's precarious situation, this solution did not lead to a positive result, but it threw the American plans into confusion again and permitted gaining time. To gain time! Is not that the only thing to do when driven into a position without issue?

After June 1, the favorable moment for coming out had gone. It was necessary to come to a decision; to look at the situation from a new point of view and to seek another use for the Spanish squadron. Well, on June 22, the expeditionary corps had begun to disembark at Daiquiri, and on July 2 the enemy's troops arrived under the city's walls. What was to be done? To go out was to succumb to the fire of the American squadron and to deprive the city of the ships' powerful artillery. Marshal Blanco was sending reinforcements by land to the besieged garrison; it sufficed perhaps for the town to hold out a few days to cause the siege to be raised and to force the Americans to re-embark. If Santiago was obliged to capitulate, it would be time enough then to go out: while waiting, the ships could take an efficient part in the defence of the city.

Marshal Blanco looked differently at the situation, and on July 2 he sent the squadron an imperative order to go out. The 3d, at 10 a. m., the Spanish vessels cleared the pass and sought to escape; at 1.20 p. m. they were all destroyed. The 16th Santiago surrendered. If the governor of the place had had the moral and material assistance that the presence of the squadron would have assured him, perhaps he would not have yielded at the very moment when General Shafter was considering re-embarking.

* * *

The Spanish squadron succumbed under the weight of accumulated errors. It was a first error to send it prematurely to the West Indies; it was a second to let it be blockaded in Santiago; it was a third to make it go out from there.

Thereafter the United States are in undisputed command of the sea. They profit by it to land in Porto Rico on July 25. Peace put an end to operations on August 12. In less than four months Spain lost her colonial empire. What a lesson for those who do not comprehend the utility of a navy!

Conclusion.

In this study, we have endeavored to justify ourselves by history, that is by actual occurrences. Doubtless the navy of to-day has no more relationship with that of fleets under sail; but the objective has not altered. The sole difference consists in solving with battleships and torpedo-boats the problem that was formerly set to wooden ships; the needs of war have remained the same.

What has particularly struck us is that all the operations of naval war, whatever they may be, reduce themselves to a single one: to occupy a field of battle.

If it is a question of attacking the enemy's coast, it is necessary, first of all, to clear the field in the region where one wishes to operate.

If it is intended to carry an army across the sea, the safety of the passage must be assured.

If, on the contrary, the capture of commerce is preferred, impunity must be guaranteed to the commerce destroyers by keeping hostile cruisers away from the cruising grounds.

In every case where it is wished to operate in a sea not free from the enemy, only operations of short duration and little scope can be undertaken. They may contribute, *if they succeed*, to aid the general operations by creating a diversion, but they will not do sufficient harm to the enemy to weigh upon the issue of the war.

But this field of battle that constitutes the principal aim must first of all be conquered. The stronger side, confident of its strength, will plant itself there from the beginning, defying its weaker adversary to come to dislodge it. The latter, not being able to attack directly the main bodies of the enemy, will seek at first to detach portions of them to weaken them; then, when it judges itself strong enough, it will draw them into a region where it disposes of all its resources and will strike a decisive blow. If it succeeds, this first victory will bring others in its train.

To obtain a first victory, movement will be necessary—much movement; it will be necessary to go to seek the enemy wherever he may be. To profit by the victory, it will be necessary to move again, to change the field of action, in order to utilize vessels that become available. These necessities fix the nature of naval forces

and the qualities that they ought to have. When the navy shall have finally adapted to the construction of its material an organization that secures the maximum return from its resources, it will have done all that it can do while awaiting the supreme moment.

This will be much. In the domain of things, order will have been substituted for disorder; simplicity, an indispensable factor of every military organism, will have taken the place of complexity and variety. In the domain of ideas, pseudo-science, which attributes a fixed and precise value to essentially variable elements, will have been driven out by simple good sense, which is guided by special circumstances and takes account of times and places.

But it is not sufficient that the navy be constituted upon rational foundations; it is necessary that it dispose of sufficient means to fulfil its rôle; *it must be victorious.* It is the country, therefore, that has to determine the magnitude of its forces, after their nature has been indicated to it.

What is the use of developing over-sea commerce, of conquering new colonies, if war is abruptly to bring us back to our natural frontiers? All the accumulated millions in naval material and in the enhanced value of our colonial domain will be lost at a single blow.

The nation knows the strength of those who covet our riches; it ought to take upon itself the sacrifices needful to preserve them, under pain of enriching its neighbor.

Surely navies are costly organisms; they are the luxury of parvenu countries. So long as a nation has not become unified, so long as it is going through that crisis of growth that precedes its natural development, all of its resources are not too much to enable it to contend upon its own territory.[198] That is why England was unable to lay the foundations of her colonial empire until after her union with Scotland. But when a nation has within herself that need of expansion which is the source of the life of peoples, she seeks to substitute lucrative epopees for heroic epopees as soon as she has attained her natural frontiers. After having taken shape, she wishes to become rich; and she demands of colonies and over-sea commerce openings for the overflow of her energy.

[198] It is none the less true that every country bathed by the sea needs a navy. The proof of it is that the kings of France were obliged, so long as they had no national fleet, to call for help from the Genoese, the Aragonaise, the Spaniards and the Dutch.

Then the navy appears.

Upon the new field of action that colonies create, peoples meet with competition. In those vast regions with undetermined boundaries, the pioneers of civilization end one day by finding themselves face to face with newcomers. One gets along as best one can; then interests end by intermingling, and, the development of peoples helping, jostlings and frictions become continual. There is a Niger question, an Egypt question, a Newfoundland question, a Morocco question, etc. Then it is that it is necessary to be strong to make one's pretensions prevail and to conserve one's acquisitions.

Let no one say there will be no more wars.[199] Nine years after Fashoda, on the morrow of the Morocco difficulties, such irony would be cruel. Cardinal Fleury also did everything to avoid it; but it burst forth one day, inevitably. When we have drunk the cup of bitterness to the dregs, we throw it at the heads of those who have forced us to drink it.

Does France wish to retain her rank? Does she intend to mingle with the irresistible current that draws all nations towards new outlets? Does she desire that the over-sea markets remain open to her? Does she presume to make her voice heard in the concert of nations? Then she needs a strong navy.

On the other hand, if she considers that her rôle as a great power has ended; if, after having held the first rank, she is not ashamed to sit in the lowest place; if, in a word, she envies the fate of Spain, then France has no need of a navy. Taxpayers, save the three hundred millions of the naval budget, rid yourselves of this burden, recall us to our families to bring up our children, and live in tranquillity and forgetfulness *until the day when your weakness shall tempt the neighbor who will devour you.*

But, if you have faith in the vitality of your race; if you wish your sons to be rich and respected; if you wish to transmit to them the heritage that you have amassed bit by bit, then a navy is necessary to you.

And what is it that we ask of you for this? More money? No. We can be content with what we have, but it must be better utilized. Surveying the whole past with a single glance, we see clearly that it is less the feebleness of our means that has betrayed

[199] The Russians did not believe any more in a war, and this confidence cost them their entire Pacific squadron.

us than the manner in which we have made use of them. To-day it is still this that will cause our loss. Once again we pretend to profit by victory before having gained it; and supposing, against all evidence, that the enemy will do likewise, we wish in advance to provide against imaginary dangers. Hence that division of efforts which makes us envisage war from three different points of view: the offensive, the defensive, commerce-destroying. Thus we have built three distinct fleets: a high-seas fleet, a coast-defence fleet, a fleet of big cruisers. One acts, another waits, the third runs away. To be strong everywhere, we have made ourselves weak everywhere. Let us no longer be astonished then that, in spite of milliards spent, our naval power decreases.

The day when we shall have a single fleet—one that shall have been created to attack the enemy—that day we shall have nothing more to fear.

"The first thing," it has been said, "that is seen to disappear in a State which is disintegrating, is the navy."

France, wilt thou be such a nation?

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

EARLY VOYAGES OF AMERICAN NAVAL VESSELS TO THE ORIENT.

By CHARLES OSCAR PAULLIN.

I.

EARLY RELATIONS BETWEEN AMERICA AND THE ORIENT: 1690-1783.

The first Americans to visit the Orient were certain hardy seafaring men from Massachusetts, Rhode Island, and New York, who during King William's war abandoned their lawful trades and embarked on a piratical career. Lured on by a love of gold and a thirst for adventure, they left their familiar haunts in the Atlantic, crossed the equator, sailed down the African coast, doubled the Cape of Good Hope, and navigated the Indian Ocean in prosecution of their lucrative calling. In the latter part of King William's war, it was no unusual sight to see these roistering freebooters, fresh from a cruise in the waters of the Orient, staggering through the streets of Boston, New York, Newport, Providence, Philadelphia, and Charleston—the ports most frequented by them. They wore a garb calculated to arouse the awe of the quiet citizens, "a broad crimson sash across the left shoulder, a laced cap, a fancy jacket, white knickerbockers, a heavy gold chain, and no less than three or four richly-mounted pistols in a gaudy belt."[1]

Not a few references to voyages in the Eastern seas made by American pirates are to be found in the early colonial records. Concerning a citizen of Massachusetts, a native of the seat of Harvard College, the Earl of Bellomont, governor of New York, wrote as follows to the Lords of Trade in London, on May 3, 1699:

Your Lordships I presume will have a full account from Boston of a parcell of pirates lately taken there with their ringleader, Joseph Bradish,

[1] Ulmann, Albert. A Landmark History of New York, 59.

born at Cambridge near Boston. The Commander, Bradish, ran away with the ship called the *Adventure* of London, an interloper to the East Indies, leaving the true Commander, Captain Gulleck, on some island in the East Indies, together with some officers and men that belonged to the ship. They came to the east end of Nassau Island [Long Island] and sunk the ship between that and Block Island. The ship of about 400 tons. I had no notice till a week after the ship was sunk, or if I had had notice I could have done nothing towards seizing or securing the ship or men without a man of Warr.[2]

A document of the date 1697, to be found in the Rhode Island colonial records, affords a glimpse of the movements of Captain Want or Wanton, a member of a distinguished family of that colony, and of several other notorious Rhode Islanders. From this source the following note has been obtained:

William Mews, a pirate, fitted out at Rhode Island. Thomas Jones is concerned in the *Old Bark*, with Capt'n Want, and lives in Rhode Island. Want is gone into the Gulf of Persia, and in all probability is either at Rhode Island or Carolina by this time. Want's wife lives there [Rhode Island]. Want broke up there about three years ago, after a good voyage and spent his money there, and in Pennsylvania.[3]

The varied career of Captain Thomas Tew, of Newport, is worthy of notice. He was a friend of Captain Misson, who founded a colony on the island of Madagascar. These two, with a third pirate, a Portuguese, named Caraccioli, established a democratic and representative government for the colony. They were elected by the people, for terms of three years, to the three principal offices. Misson was the "lord conservator"; Tew, the "admiral"; and Caraccioli, the "secretary of state." Slavery was abolished. The coast of Madagascar was surveyed, and an exact chart made showing sands, shoals, and depths of water. A fort, batteries, wharves, and ships were constructed. One piece of land the pirates placed under cultivation, and another piece they enclosed for pasture, upon which at one time three hundred head of black cattle were grazed. With their settlement as a base, they made forays upon the shipping of the Indian Ocean, and especially upon that of the Red Sea. On one occasion they captured, off the coast of Arabia, a vessel belonging to the Grand Mogul, which had on board sixteen hundred souls, including some pilgrims to Mecca and some Moorish mariners. Many valuable

[2] Colonial History of New York, IV, 512.
[3] Rhode Island Colonial Records, III, 322.

prizes were taken and much wealth was accumulated, but finally owing to a series of misfortunes the colony was abandoned. Tew returned to Rhode Island.[4]

The first merchandise direct from the Orient exposed for sale in America was brought to this country by pirates. Arabian gold, pearls from the Indian Ocean, and Oriental fabrics abounded in the chief cities of the colonies. The treasure of Captain Kidd that was seized in Boston in 1699, contained a characteristic assortment of piratical plunder: "an iron chest of gold, pearls, etc., 40 bails of East India goods, 13 hogsheads, chests and case, one negro, and Venture Resail, a Ceylon Indian." Resail was one of the first Asiatics to visit America.[5]

By 1710 the piratical voyages of the colonists to the Eastern seas had ceased, and from this time to 1783 few or no Americans visited those waters. Certain articles of Oriental merchandise, however, continued to find their way to America. From the close of Queen Anne's war until the outbreak of the Revolution, considerable quantities of Chinese tea and chinaware were used by the colonists, coming by way of England, to which country they were imported from Canton, China, by the British East India Company. It was these articles that brought America for the first time into relation with the Far East. Indeed Chinese tea has a direct connection with the American Revolution, as every one knows—a connection that has led one historian, having in mind the resistance of the colonists to the British tax on tea and the Boston Tea Party, to assert that "in this little Chinese leaf was folded the germ which enlarged into American independence."[6]

At least one American product, ginseng, an article highly prized by the Far Eastern peoples for its medicinal properties, was imported into China by the British East India Company. It is said that this company sent agents to the Northern colonies, who induced the Indians by gifts of money, whiskey, and trinkets to search the woods for ginseng. That illustrious divine, the Reverend Jonathan Edwards, who conducted an Indian school at

[4] Johnson, Charles. A General History of the Pyrates, II, 81, 110, 265; Sheffield, W. P. Privateersmen of Newport, 39; New Jersey Archives, 1st Ser., II, 277.

[5] Weeden, W. B. Economic and Social History of New England, I, 345-351.

[6] Weeden, W. B. Economic and Social History of New England, II, 539.

Stockbridge, Massachusetts, was sorely grieved at the demoralization of his dusky pupils caused by the offer of the agents.[7]

At the time of the American Revolution, the seagoing trade between the Occident and the Orient was in the hands of the chief commercial nations of Europe—Great Britain, the Netherlands, France, Spain, and Portugal. Each of these countries had colonies or trading posts in Southern or Eastern Asia. Great Britain was firmly intrenched in India, with Calcutta, Madras, and Bombay as her chief ports. After the Seven Years' War, France still retained a foothold on the Coromandel coast. Portugal held Goa in India, and Macao in China. Next to the English in the importance of their possessions were the Dutch, whose settlements in the East Indies were strategically located. Their capital was Batavia, situated on the island of Java. The Spanish were firmly established in the Philippines, with Manila as their chief city. In the Far East—China, Korea, and Japan—only three ports were open to the European trade, and one of these, Nagasaki, Japan, to the Dutch only, and to them in a limited way. The other two ports, Macao and Canton, China, carried on a considerable commerce with England, the Netherlands, France, and Portugal.

On the outbreak of the Revolution in 1775 the revolting colonies established a small navy, but owing to its weakness as compared with the powerful fleet of the mother country, it was forced to engage chiefly in the destruction of British commerce. Its ships visited every trade route of the North Atlantic, and not infrequently returned home richly laden with captured spoils. Casting about for a profitable employment of its navy, the Continental Congress was impressed with the promising field for commerce-destroying presented by Great Britain's Oriental trade. In December, 1777, its Committee of Foreign Affairs formulated a plan for a naval expedition to the coast of India, which was set forth as follows in a letter of the committee to the American Commissioners at Paris:

> As the Marine Committee have already sent some, and will order more, of the Continental ships of war to France, under your directions, permit us to suggest an expedition, which appears likely to benefit us and distress the enemy. We are informed that two or three well-manned frigates, dispatched early in February, so as to arrive at the island of Mauritius

[7] Speer, William, The Oldest and the Newest Empire China and the United States, 410-411; Griffis, W. E., Corea the Hermit Nation, 388-389; Macpherson, David, Annals of Commerce, III, 497, 545, 572.

in June, being provided with letters of credence, and for such refreshments or aid of stores, etc., as may be necessary, from the minister to the French governor of that island, may go thence to cruise on the coast of Coromandel, twenty days' sail from the Island of Mauritius, where they will be in the way to intercept the China ships, besides distressing the internal trade of India. The prizes may be sold at Mauritius. Our vessels had better call at Goree, then at the Cape, to avoid the vigilance and the apprehension of the British cruisers.

Goree (on the west coast of Africa), the Cape of Good Hope, and Mauritius were important ports of call for vessels bound to the Indian Ocean. The "China ships" were the British merchantmen employed in the trade between Canton and British India, and the "internal trade" was the India coasting trade. The plan of the committee was not favorably regarded by the commissioners, as may be seen from the following extract from a letter of Commissioner Arthur Lee to the committee, dated Paris, July 29, 1778:

It has been forgotten, I believe, to mention, both in our joint and particular letters, that we have attended to the plan proposed by the committee of sending the frigates to cruise in the East Indies, and upon considering all things it seemed to us impracticable at present. Better order must be established in our marine, and the ships' companies better sorted, before it will be safe to attempt enterprises at such a distance, and which require a certain extent of ideas in the captain and entire obedience in the crew.[8]

The Committee of Foreign Affairs did not urge its plan. The navy had already begun to decline, and by the close of 1779 it was not sufficiently strong to undertake a cruise to the East Indies had it desired to do so. It was left to the new navy established under the Constitution in 1794 to make the first voyage to that distant quarter of the globe.

II.

THE FIRST NAVAL VOYAGE TO THE EAST INDIES: 1800.

Before the Revolutionary War the longest voyages made by American merchantmen were those to the west coast of Africa, where slaves, ivory, and gold dust were to be had in exchange for New England rum. The acquiring of independence by the thirteen colonies opened up a new field for commerce. Scarcely was the ink dry on the Treaty of Paris of 1783 before several enter-

[8] Wharton, Francis. The Revolutionary Diplomatic Correspondence of the United States, II, 440-441, 673-674.

prising merchants of New York and Philadelphia purchased the ship *Empress of China*, of three hundred and sixty tons burden, loaded her with four hundred and forty piculs of ginseng and some other articles of commerce, and sent her to Canton for a load of tea and Chinese manufactures. Her captain was John Green, and she carried a "second captain" and a full complement of inferior officers, including two midshipmen. She also carried, as supercargo, a young and gallant Bostonian, fresh from the fields of war, Major Samuel Shaw, late of the Continental artillery, and now entering upon a mercantile career. She sailed from New York on her memorable voyage on February 22, 1784, the anniversary of Washington's birth; and, after touching at the Dutch settlements in Java and the Portuguese port Macao, arrived at Canton on August 28, the only port in the Chinese empire open to foreign ships. Measured on the route sailed by the *Empress of China*, the distance from Canton to the Cape of Good Hope was about sixty-seven hundred miles, and to New York about thirteen thousand seven hundred miles.[9]

Eager to increase their trade, the shrewd Chinese merchants welcomed their strange visitors. Major Shaw wrote:

> Ours being the first American ship that had ever visited China, it was sometime before the Chinese could fully comprehend the distinction between Englishmen and us. They styled us the New People, and when by the map we conveyed to them an idea of the extent of our country, with its present and increasing population, they were not a little pleased at the prospect of so considerable a market for the productions of their own empire.[10]

The *Empress of China* arrived home at New York on May 11, 1785, after an absence of almost a year and three months. The next ship to visit the Orient was the *Grand Turk*, Captain Ebenezer West. She sailed from Salem, Massachusetts, for Canton in December, 1785, and arrived home in May, 1787, 65 days from the Cape of Good Hope. On her outward voyage she touched at several ports of India, displaying there for the first time the stars and stripes. In 1786 eight vessels sailed for Eastern ports: the *Leda*, of Boston; *Hope*, *Empress of China* and *Experiment*, of New York; the *Canton*, of Philadelphia; the *Chesapeake* and *Betsy*, of

[9] For information respecting the early American commerce in the Orient, see Samuel Shaw's Journals, the Journals of the Continental Congress for 1786-1788, and the American newspapers for the period 1786-1790.

[10] Shaw, Samuel. Journals, 183.

Baltimore; and the *Hope* of Norfolk. Major Shaw, who in January, 1786, was chosen by Congress to be consul at Canton, the first consular position established in the Orient, gives in his journal the following list of shipping at Canton "for the present season, down to the 27th of January, 1787": English ships for Europe, 29; English country ships for India, 23; Dutch ships, five; Portuguese from Macao, five; Danish, two; Spanish, two; French, one; Swedish, one; and American, five. In 1789, 15 American vessels visited Canton, four of which belonged to Elias Hasket Derby, the noted Salem shipmaster.

All the chief ports of New England and the Middle States became interested in the Eastern trade. Norfolk, Virginia, sent a ship to Canton as early as 1786. The Carolinas, however, displayed little fondness for exploring the new commercial routes. The wealthy city of Charleston fitted out but a single vessel for the Eastern seas. Of the northern cities, Philadelphia, New York, Boston, and Salem were in the lead. As considerable capital was needed even for a single venture, it was sometimes raised by subscription, as may be seen from the following advertisement, extracted from the *Independent Chronicle* of Boston for June 23, 1785:

> Proposals for building and fitting out a ship for the East India trade have been approved of by a considerable number of citizens, who met at Mr. Walter Heyer's in King Street, on Thursday evening last. Several gentlemen are named to receive subscriptions, and this is to give notice that another meeting is appointed on Wedn. evening next, at the same house, when any citizen who wishes to become interested may have an opportunity. A single share is only $300.

Many noted American families laid the foundation of their wealth in the Eastern trade. Among those of Boston and Salem that owned numerous "India ships" were the following: Russell, Derby, Cabot, Thorndike, Barrett, Brown, Perkins, Bryant, Sturgis, Higginson, Shaw, Lloyd, Lee, Preble, Peabody, Mason, Jones, and Gray. In 1787, Providence, Rhode Island, sent out her first vessel, the *General Washington*, the property of Messrs. Brown, Francis, and Pintard. Soon Newport, Nantucket, New Bedford, New Haven, and Bristol were added to the list of New England ports trading with the East Indies and the Far East. In 1789 one of Elias Hasket Derby's ships brought home the first cargo of Bombay cotton imported to the United States. In the previous year a Baltimore vessel, the *Chesapeake*, showed the American colors in

the Ganges for the first time. When this ship arrived at Bengal the local government was in doubt as to how the flag of the new American nation was to be received, and it applied by letter for instructions to the governor-general of the British possessions, Lord Cornwallis, who a few years before had surrendered his army to General Washington at Yorktown, and who on the arrival of the *Chesapeake* was in the interior of India. Cornwallis replied that the American flag was to be received in the same manner as the flags of the most favored nations, since it stood on the same footing with them.[11]

The merchants of Philadelphia invested much capital in the new commerce, and several Revolutionary naval officers and privateersmen commanded East Indiamen—Truxtun, Read, Tingey, Dale, Josiah, and Barry. Read's ship was the Continental frigate *Alliance*, at one time commanded by John Paul Jones, and sold by the government in 1785 to Robert Morris, the famous financier of the Revolution. On her first voyage she did not let go an anchor between Philadelphia and Canton, passing to the eastward of the Dutch East Indies. There is another interesting connection between the *Alliance* and the Oriental trade. In 1789 her builder, William Haskett, built for that trade at Quincy, Massachusetts, the ship *Massachusetts*, of 820 tons burden, the largest vessel up to that time constructed in the United States.[12] In 1791 Stephen Girard, of Philadelphia, began the construction, for the Calcutta and China trades, of a class of beautiful vessels long the pride of that city. He named four of his ships, respectively, *Montesquieu*, *Helvetius*, *Voltaire*, and *Rousseau*, after the French free-thinkers, thus revealing his sympathy with their philosophical and religious dogmas and advertising it to the world. The first Philadelphia vessel to visit the Orient was the ship *Canton*, Captain Thomas Truxtun, who subsequently entered the navy and distinguished himself by fighting the only frigate fights of our naval war with France. On January 2, 1876, the Continental Congress granted Truxtun a sea-letter. Its quaint phraseology bears witness that our government had not yet declared its independence from the documentary forms of the old country.

[11] Scharf, J. T., Chronicles of Baltimore, 248; Macpherson, David, Annals of Commerce, IV, 183.

[12] Delano, Amasa. Narrative of Voyages and Travels, 21-25.

Most serene, serene, most puissant, puissant, high illustrious, noble, honorable, venerable, wise, and prudent emperors, kings, republics, princes, dukes, earls, barons, lords, burgomasters, counsellors, as also judges, officers, justiciaries, and regents, of all the good cities and places whether ecclesiastical or secular, who shall see these presents, or hear them read:

"We, the United States in Congress assembled, make known that Thomas Truxtun, captain of the ship called the *Canton* is a citizen of the United States of America, and that the ship which he commands belongs to citizens of the said United States, and as we wish to see the said Thomas Truxtun prosper in his lawful affairs, our prayer is to all the before-mentioned, and to each of them separately, where the said Thomas Truxtun shall arrive with his vessel and cargo, that they may please to receive him with goodness and treat him in a becoming manner, permitting him upon the usual tolls and expenses in passing and repassing, to pass, navigate, and frequent the ports, passes, and territories, to the end to transact his business where and in what manner he shall judge proper, whereof we shall be willingly indebted." [13]

In the last decade of the eighteenth century our Eastern trade gradually increased, and by the time of our naval war with France it had become quite extensive. During this conflict it lay more or less at the mercy of the French ships of war that frequented the East India seas. To protect it from them, President Adams decided late in 1799 to send the frigates *Congress*, Captain James Sever, and *Essex*, Captain Edward Preble, to Batavia to convoy home the American merchantmen intending to sail from that port in May or June of the following year. As the *Congress* did not succeed in making the voyage, no notice of her and her commander need be here given. The *Essex* was a 32-gun frigate of 860 tons burden, carrying 300 men. She was built at Salem, Massachusetts, in 1799, by the patriotic citizens of that town for the use of the federal government. The subscription list for her construction was headed by William Gray and Elias Hasket Derby, each of whom gave $10,000.[14] Captain Richard Derby, a nephew of Elias, was appropriately chosen to command the new ship; but when she was ready to receive her commander young Derby was at sea, and consequently the secretary of the navy selected Captain Edward Preble to take charge of her. Preble was destined to win many laurels in the coming Tripolitan War and to achieve a standing beside Truxtun as one of the most distinguished officers of the early navy under the Constitution. He was born in Portland,

[13] Journals of the Continental Congress, January 2, 1786.
[14] Hunt's Merchant Magazine, XXXVI, 179.

Maine, in 1761, coming from excellent Yankee stock. During the Revolution he served first as midshipman and later as lieutenant in the Massachusetts navy; and after that war he entered the merchant service, which he left in 1798 to accept a lieutenancy on board the frigate *Constitution*. His first command was the brig *Pickering*, and his next the frigate *Essex*.

On January 7, 1800, the *Congress* and *Essex* sailed from Newport, with three outward-bound East Indiamen, under convoy, which proving to be dull sailers were soon left behind. On the 12th the two frigates parted company in a gale, and a little later the *Congress*, having been dismasted, was forced to return to port. Unaware of Sever's misfortune, Preble continued the voyage alone. On February 7 he crossed the equator, and a little more than a month later cast anchor at the British settlement near the Cape of Good Hope to water his ship and await the arrival of the *Congress*. Here he found seven British men-of-war, under the command of Admiral Sir Roger Curtis, and six East Indiamen—three American ships, two English, and one Swedish. He was cordially received by the British officials at the Cape, with whom he exchanged courtesies. On different days he dined ashore with the admiral, the governor of the colony, the commander-in-chief of the local troops, and the director of East India affairs for the British East India Company. The captains of the British men-of-war, the United States consul, and General Vandalure, of the British Army, dined on board the *Essex*. On March 28 Preble weighed anchor and sailed for the Straits of Sunda, where he arrived on May 5. His movements for the next two months are best told in his own words, extracted from a letter to the Secretary of the Navy:

> I have the honor to acquaint you that the U. S. Frigate *Essex* under my command arrived at the entrance of the straits of Sunda the 15th of May. I watered ship at Mew Island, and was employed in cruising until the 15th when I anchored at Batavia, and was received by the Governor in the most friendly and flattering manner. On the 20th of May I sailed from Batavia on a cruise, after having refreshed my ship's company, made the necessary arrangements respecting the provisions and stores for the frigates, and appointed the 10th of June for the sailing of the fleet from Batavia for the United States. I cruised in the entrance of the Straits for a fortnight, in which time I boarded thirteen sail of American merchant ships richly loaded, the whole of which must have been captured had a single French Privateer of 16 guns been cruising in my stead, but fortunately for our trade it had met no interruption for two or three

months; and there being no French cruisers in the Straits, I returned towards Batavia, where I arrived the 8th of June; and finding every vessel bound for the United States would be ready to sail by the 17th, I prolonged the time of sailing to that day. In the meantime I received on board provisions and stores for six months and appointed Jacobus Theodorus Reynst, Esq., agent for the sale of the provisions and stores designed for the *Congress*, with directions to have them sold if she should not arrive by the 15th of July.

On the 15th of June, I delivered signals and instructions to fifteen vessels, being all that were bound to the United States, and all except three at Batavia. The 16th I moved the *Essex* down to Onrust, and on the 19th weighed anchor and sailed with thirteen ships and brigs under convoy, the other two concluding to join me below. The 21st, a Dutch proa came alongside with the master, supercargo, and a part of the crew of the American Ship *Altenamak*, of and from Baltimore, bound to Batavia. She was captured at the entrance of the Straits the 15th by a French Corvette of 22 guns and 250 men, which arrived in the Straits on that day from the Isle of France. Four other privateers were to sail for the Straits after her, one of them a ship of 32 guns.

I continued to proceed down the Straits, making slow progress, with the wind constantly ahead. 22d, anchored the Fleet in Anjer Roads, wind directly contrary and very light breezes, the French Corvette in sight hovering about the Fleet. At 1 P. M. I gave chase to her, which was continued until dark, but the lightness of the wind enabled her to make use of her sweeps to such advantage as to escape, and I returned to the Fleet again. 24th, a Dutch proa came alongside, by which I received information of the arrival in the Straits of a French ship of 32 guns and much crowded with men. The Dutchman that commanded the proa had been on board her the day before, and I suppose she must have passed the convoy in the night, as she stood over towards the coast of Sumatra. This ship the Dutchman declared to be a frigate from France, and which had only touched at the Isle of France. At 10 A. M. the French Corvette in sight approaching the Fleet at anchor under Java shore between Anjer and Pepper Bay, very light winds, almost calm. At noon, the breeze increasing, I weighed anchor and gave chase, which I continued until 5 o'clock in the evening, at which time I had gained so much on her that nothing but its falling calm and the assistance the Frenchman received from his numerous sweeps saved him from capture; had there been only a moderate breeze I must have taken him. For want of wind I was not able to join the Fleet again until the next morning.

I proceeded down the Straits and on the 27th anchored with the Fleet in Mew Bay for the purpose of watering. The 30th one of the vessels left at Batavia joined me, the master of which informed me that the other ship, the *Magnus* of Philadelphia, would not be down to join the convoy as the Captain had anchored her at Bantam to wait for the recovery of a sick supercargo. The 1st of July, having completed their stock of water, I proceeded to sea with fourteen sail under convoy as per list enclosed.

It is singularly unfortunate for the American trade that the *Congress*

did not arrive at Batavia, as in that case she could have convoyed the Fleet home, and I might have been left to clear the Straits of those pirates, but now they can do as they please as they have no force left to oppose them, the English squadron having left the station. I fear every merchant ship that attempts to pass the Straits will fall a sacrifice. The necessity of a constant protection of our trade in the Straits will, I presume, be sufficiently apparent.

I am in hopes to double the Cape of Good Hope in ten days with the Fleet; at present I have them all with me. I have granted permission to the Brig *Lapwing* to separate from the convoy and proceed alone, the master of which takes charge of my dispatches. My ship's company have been remarkably healthy; you will see by the Surgeon's daily report our present state.[15]

Preble's fleet of 14 merchantmen were laden chiefly with coffee, sugar, and pepper. Exactly one-half of them were bound to Philadelphia. Two were bound to Boston, two to Baltimore, and one each to Salem, Newport, and New York. Their average burden was about 250 tons. The smallest vessel of the fleet was the brig *Sally*, of 113 tons burden, carrying six guns and eight men. The largest vessel was the ship *China*, of 1055 tons burden, carrying 151 men and 36 guns, and commanded by Captain James Josiah, a Revolutionary naval officer. The other vessels of the fleet carried from eight to 20 men, and from two to 10 guns. At this time all East Indiamen were armed with cannon, and their crews were trained to use them.

On August 11 Preble encountered a heavy gale off the bank of Agulhas, on the southeast coast of Africa, and the ships of the fleet were separated. He had previously given orders that the vessels if dispersed should meet at St. Helena. He arrived at that island on September 10. The succeeding events of his cruise may be followed by means of some extracts from the journal of the *Essex*.

Sept. 11. Brig *Globe*, one of the convoy, arrived.

Sept. 12. Ship *Juno*, one of the convoy, arrived. Saw plenty of whales and porpoises in the Roads.

Sept. 13. Hoisted the boats out in the morning, and in at night, as usual.

Sept. 14. The Ship *Nancy* and Brig *Lydia* of our convoy arrived.

Sept. 15. Ship *Dominick Terry* arrived. Has lost all her boats and had her quarter galleys stove in by bad weather off the Cape of Good Hope. Watering ship.

Sept. 16. Ship *Globe* sailed for home.

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[15] Preble, G. H. The First Cruise of the United States Frigate *Essex*, 95-97.

Sept. 17. Finished stripping the masts, and have replaced the rigging in good order. The Governor and officers of this place appear very friendly.

Sept. 18. Ship *China*, one of the convoy, arrived.

Sept. 20. Arrived the Ship *John Bulkley*, which spoke the Brig *Lapwing* on the 14th of August, which had lost both her masts at the deck. She was thrown on her beam ends by the wind and sea, and cut away her mast to right her. With both pumps freed her in six hours. Capt. Stockley of the *John Bulkley* supplied the *Lapwing* with every thing that was needed, such as spars and sails, and Captain Clap of the brig thought he should reach the Cape of Good Hope very well. He adds that Captain Gardner's Brig *Globe* passed him within half a mile while his signal of distress was hoisted, and did not come to him.

Sept. 22. Three English ships arrived.

Sept. 23. Sailed the *Dominick Terry* for Philadelphia.

Sept. 24. Snow. The *Sally*, one of our convoy, arrived, with Midshipman Brown, John Beard, Moses Harriman, and Ralph Wright, our men which we lent Captain Hall in the Straits of Sunda.

Sept. 25. Arrived the Brig *Exchange*, of the convoy.

Sept. 26. Fired a gun. Made signal one. Unmoored at 10 A. M. Hoisted in the boats. Sent Mr. Shed and two men to the *Sally*. Got under way, in company with seven of the convoy.

Oct. 2. Ascension Island in sight.

Oct. 4. Spoke the Brig *Anna Maria*, from Bordeaux bound to Tranquebar, under Swedish colors.

Oct. 6. All the Fleet in sight. Continue to keep the two brigs in tow.

Oct. 7. Whipped Andrew Knowland, the cook, for striking William Woodbury with an axe.

Oct. 10. Recrossed the line in Longitude about 28° 50′ W.

Oct. 11. All the Fleet continue in sight. Saw St. Paul's rocks.

Oct. 12. Charles Swede, who had been sick ever since he came on board at Batavia, died.

Oct. 20. Lost sight of the Brig *Sally*.

Oct. 31. A gale of wind.

Nov. 2. Sent the jolly boat on board the Ship *Nancy* with a supply of bread.

Nov. 13. Chased and brought to after two shots the Brig *Eliza*, Captain Bullock, from Rhode Island, bound to Turk's Island, 10 days out. Chased and spoke Brig *Harriet*, Capt. Babson, from Tortola bound for Boston.

Nov. 14. Capt. Hale and Capt. Stockley asked leave to quit the Fleet.

Nov. 17. Ship *John Bulkley* left the Fleet.

Nov. 27. At 8 P. M. sounded in 45 fathoms, black and white sand.

Nov. 29. At 1 P. M. Sandy Hook lighthouse bore N.W. 7 miles. At 8 came to anchor in 17 fathoms, the Battery bearing E.N.E., 1 mile. At 7 weighed and made sail for the East River. At 3 P. M. moored ship, Brooklyn Point, East. Unbent courses, staysails, and topgallant sails.[18]

[18] Preble, G. H. The First Cruise of the United States Frigate *Essex*, 82-85.

The first voyage of an American ship of war to the East Indies came to an end with the arrival of the *Essex* at New York on November 29, 1800. Preble at once sent his dispatches to the Secretary of the Navy, who wrote to him congratulating him on his safe return. Preble had conducted the voyage with skill and good judgment, and had rendered an important service to our commerce in the East Indies.

III.

THE CRUISE OF THE "PEACOCK": 1815.

The American trade with the East Indies and the Far East was almost suspended during the last two years of the War of 1812. Now and then, however, a vessel succeeded in evading the British blockading fleet on the coast of our Atlantic States, and made the long voyage to the Orient, perchance only to fall into the hands of some British ship of war in that quarter of the globe. The movements in the China seas of His Majesty's ship *Doris* give us a notion of the events that happened there during the war. In April, 1814, the *Doris* captured the American merchantman *Hunter* off the Ladrone Islands not far from Macao and brought her into the Canton river, which channel she then proceeded to blockade, in disregard of international law. In May her boats chased an American schooner from the neighborhood of Macao to Whampoa and captured it within 10 miles of Canton. Fortunately before the captors could carry their prize down the river it was retaken by some American boats.[17]

Toward the close of the war the government at Washington decided to send a small fleet of naval vessels to Asiatic waters to protect our commerce and to prey upon the enemy's China and India ships. The navy department chose Commodore Stephen Decatur to command the fleet, and instructed him to return by way of the Northwest Coast, provided it was found feasible, and to retake Astoria, which post the British had captured in 1813. Decatur's flagship was the 44-gun frigate *President*. The other vessels of his fleet were the sloops-of-war *Peacock*, 18, Captain Lewis Warrington, and *Hornet*, 18, Master Commandant James Biddle, and the storeship *Tom Bowline*, Lieutenant B. V. Hoffman. Early in January, 1815, these four vessels were at New

[17] Brinkley, F., China, X, 210; Davis, J. F., China, I, 78.

York ready to undertake their distant mission. On January 14, the *President*, unaccompanied by her consorts, put to sea, but unfortunately she was captured on the following day by the British blockading squadron that lay off the coast.

The ranking officer of the three ships remaining in port, and on the capture of Decatur, the commander of the fleet, was Captain Lewis Warrington. He had served as a midshipman in the Tripolitan War, and was one of the officers to whom Congress gave a vote of thanks for their services in that conflict. He was promoted to be lieutenant in 1807, and master commandant in 1813. On his first cruise as commander of the *Peacock* he captured the British sloop *Epervier*, and for this highly creditable performance received a gold medal, the thanks of Congress, and a promotion to a captaincy. In the summer and fall of 1814 he made a successful cruise again British merchantmen off the coast of Ireland. Indeed, but few officers of the War of 1812 exhibited greater skill and proficiency in the naval profession than Warrington.

On January 23 the *Peacock*, *Hornet*, and *Tom Bowline* sailed from New York for the islands of Tristan da Cunha, which lie 1500 miles south-southwest of St. Helena. Three days out of port the *Hornet* parted company with her consorts, and being the faster sailer was the first to reach the appointed rendezvous. As she neared it on the morning of March 23 she fell in with the British sloop-of-war *Penquin*, 18, and captured her after a brilliant fight lasting 22 minutes. The prize was so much injured that it was scuttled and sunk. Warrington, who arrived at the islands soon after the engagement, converted the *Tom Bowline* into a flag of truce, and, placing the officers and crew of the *Penquin* on board her, sent her to Brazil.[18]

After waiting 20 days for Decatur, not knowing of his capture, Warrington and Biddle sailed for the second rendezvous, the islands of St. Paul and Amsterdam, situated in the Indian Ocean midway between the Cape of Good Hope and Australia. Nothing of importance happened until April 27, when, in latitude 38° 30′ south and longitude 33° east, they made a strange sail in the northeast and stood towards it, taking it to be an Indiaman. By the afternoon of the 28th they had approached near enough to ascer-

[18] For the movements of the fleet, see Captains' Letters, Archives of the U. S. Navy Department, XLII, 65; XLIII, 112; XLIV, 27, 32; XLV, 19; XLVII, 2, 17.

tain that it was a ship of the line. On discovering its true character, they fled, steering different courses. The *Hornet* was pursued, and was soon widely separated from her consort. She was chased for almost two days, a part of which time her antagonist was within gunshot, but fortunately his fire did little damage. Finally she made her escape by throwing overboard her anchors, cables, spare spars, and all her guns except one. Being practically defenseless, she discontinued her voyage and returned to the United States.

Of the movements of the *Peacock*, after she parted company with the *Hornet*, Warrington wrote to the Secretary of the Navy as follows:

> In May we reached the Isles of St. Paul and Amsterdam (our second rendezvous) where we found a letter for us, which had been left a few days before by the *Macedonian* brig, informing us of the *President's* action and probable capture. Here I had intended remaining some time to regain the *Hornet;* but being carried to leeward in chase of a strange sail, we were not able to regain them and were at last compelled by a severe gale to bear up, and on the 8th of June made the Island of Java. From that time until the 29th, we were cruising in the Straits of Sunda, where we made four captures, two of which were burnt, a third was given up to carry 150 prisoners into Batavia, and the fourth released, as from her we learned that a peace had been made.
>
> From the different captures we obtained about fifteen thousand dollars in specie, and gold to the amount of four or five thousand dollars more. We have on board ten chests of opium. The first prize was loaded with pepper, and a few bales of coarse goods, for the Malay market; some of which (as he had no room to stow them away) we distributed amongst the crew, as they were much in want of thin clothes. Of the money, five thousand dollars were divided by me amongst the officers and men.
>
> From Java we proceeded to the Island of Bourbon, where we procured bread and other articles, for which we were much in want, as we were on an allowance of half a pound of bread per man. From Bourbon, which we left in August, we made the best of our way to the United States, touching for a few days at St. Helena.[19]

The vessels captured by Warrington were the East Indiamen *Union, Venus,* and *Brio de Mar,* carrying 161 men; and the British East India Company's cruiser *Nautilus,* carrying 14 guns and 130 men. The *Nautilus* was taken after an engagement, in which she suffered considerably, having 15 men killed or wounded. Among the wounded was her commander, Lieutenant Boyce, who lost a leg. The *Peacock* was uninjured. All these captures were made after the conclusion of peace.

[19] Niles' Register (Baltimore), IX, 188.

A question of veracity was raised by the varying accounts of the fight between the *Nautilus* and *Peacock* given by the British and the American commanders. The former said that Warrington was notified before the firing began by the master attendant at Anjer, Java, that peace had been concluded between the United States and Great Britain. Warrington denied this, as may be seen from his official account of the engagement:

As it is probable you will hereafter see or hear some other account of a rencontre which took place between the *Peacock* and the English East India company's brig *Nautilus*, on the 30th of June last, in the Straits of Sunda, I take the liberty of making known to you the particulars:

"In the afternoon of that day, when abreast of Anjier, as we closed with this brig, which appeared evidently to be a vessel of war, and completely prepared for action, her commander hailed and asked if I knew that there was a peace? I replied in the negative—directing him at the same time to haul his colors down, if it were the case, in token of it—adding that if he did not, I should fire into him. This being refused, one of the forward guns was fired at her, which was immediately returned by a broadside from the brig; our broadside was then discharged, and his colors were struck after having six Lascars killed, and seven or eight wounded. As we had not the most distant idea of peace, and this vessel was but a short distance from the fort of Anjier, I considered his assertion, coupled with his arrangements for action, a finesse on his part to amuse us, till he could place himself under the protection of the fort. A few minutes before coming into contact with brig, two boats containing the master attendant at Anjier, and an officer of the army came on board, and as we were in momentary expectation of firing, they were with their men passed below. I concluded that they had been misled by the British colors, under which we had passed up the straits. No questions, in consequence, were put to them, and they very improperly omitted mentioning that peace existed. The next day, after receiving such intelligence as they had to communicate on this subject (no part of which was official), I gave up the vessel, first stopping her shot holes, and putting her rigging in order."[20]

The *Peacock* was the only vessel of Decatur's squadron that reached the East Indies, and like the *Essex*, did not proceed farther than Java. She returned home by way of the Cape of Good Hope, arriving in New York on October 28, 1815, several months after the close of the war. No national vessel had as yet visited India, China, Japan, or the Philippines, and none had crossed the Pacific.

[20] Niles' Register (Baltimore), X, 58.

IV.

THE FIRST NAVAL VOYAGE TO CHINA: 1818-1821.[21]

On the termination of the war with Great Britain in the spring of 1815, the Oriental trade rapidly revived. Within a year and a half 42 vessels had cleared from Salem for the ports of Asia, and 16 of them had returned home by way of various ports of Europe and America, at which they had discharged their cargoes of Eastern merchandise. In 1821 Salem had 58 vessels in the Oriental trade. During the eight years immediately preceding the War of 1812 the number of American vessels annually visiting Canton was 29, during the three years of the war six, and during the first five years after the war 39. By 1820 the commerce of America with China exceeded that of every other Occidental nation, with the exception of Great Britain. The chief products carried to China by American merchantmen were ginseng, opium, quicksilver, lead, iron, copper, steel, sea and land otter skins, seal, fox, and beaver skins, cotton, camlets, sandalwood, and broadcloths. The chief articles imported to America from China were teas, silks, cassia, camphor, rhubarb, sugar, vermillion, and chinaware.[22] On the establishment of the Pacific fur trade, about 1790, China became a great mart for peltries.

To protect our merchantmen from the pirates that frequented the East Indies and to afford our navy an opportunity to exercise and improve its officers and sailors in navigation and seamanship, the Navy Department in the fall of 1818 ordered the frigate *Congress* to be fitted out for a two years' cruise in the Eastern seas. The *Congress* was a 36-gun ship, of 1268 tons burden, carrying 350 officers and seamen. Her captain was John Dandridge Henley, a native of Virginia and a nephew of Mrs. Martha Washington. He entered the navy as a midshipman in 1799, and was made a lieutenant in 1807, a master commandant in 1813, and a captain in 1817. He was one of the officers of the sloop of war *Peacock* when in 1814 she captured the *Epervier*, and later he took part in the battle of New Orleans, receiving the commendation of General

[21] This chapter is based chiefly upon Captains' Letters, U. S. Navy Dept. Arch., LXI, 110; LXII, 10, 48, 85; LXIII, 68; LXIV, 36; LXV, 7, 17, 30, 99; LXVI, 78, 82, 127; LXVII, 129; LXVIII, 15; LXIX, 70; LXX, 32, 40, 94; LXXI, 76, 94.

[22] Gützlaff, K. F. A. A Sketch of Chinese History, appendix.

Andrew Jackson for important services rendered in that fight. His last tour of sea duty was in the West Indies as commander-in-chief of the West India squadron, dying there in 1835.

Henley equipped the *Congress* at Norfolk, and early in 1819 sailed up the Chesapeake to Annapolis to receive on board his ship the newly-appointed American Minister to Brazil. While he was anchored there the Secretary of the Navy sent him his sailing orders, which were in part as follows:

> You have been appointed to the command of the United States Frigate *Congress* to proceed upon important service for the protection of the commerce of the United States in the Indian and China Seas.
>
> You will receive on board, off Annapolis, the Honorable John Graham and family, and embrace the first favorable wind after they shall embark to proceed to sea, and direct your course to Rio de Janeiro, the Capital of the Portuguese Government in Brazil, where Mr. Graham and family will be landed; on this occasion you will attend to the usual salutes and pay all respect to the Government and authorities of the place, and consistent with the occasion of your visit. Make as short stay as possible at Rio de Janeiro, and after filling up your water and taking on board such fresh supplies as the country may afford, particularly for the health of the crew, proceed from thence by the most direct route to Canton in China, report your ship there, and after paying respect to the Government of the place, inform yourself of all the American ships in port, and enter into engagement with their commanders and supercargoes to convoy them through the Straits safely, beyond the hostile attacks of the Islanders and pirates, who infest those seas; and then continue to cruise to and from Canton, and in the neighborhood of the Straits of Sunda for the general protection of American ships and property, taking occasion at stated periods to notify the ships and vessels at any of the ports in those seas of your readiness to afford them protection to certain limits as shall appear to you to be necessary for their safety.[2]

On May 16, 1819, Henley sailed from Hampton Roads for Rio Janeiro, where he arrived on July 3. After landing his passengers for this port and taking in refreshments, he proceeded on his voyage. On September 2 he made St. Paul's Island in the Indian Ocean, on the 20th he entered the Straits of Sunda, and on the following day he anchored at Anjer Road, Java, where the Dutch had erected a small fort. Here he remained three days to provision and water his ship. Of provisions, he was able to obtain only rice. Water, he said, could be procured in any quantity at Anjer, "but of the worst quality, and very high in consequence of the immense distance which it is conveyed by an aqueduct erected

[2] Private Letters 1813-1840, U. S. Navy Dept. Arch., 262.

by the Dutch at considerable expense." From this port Henley proceeded through the Straits of Banca with several American merchantmen under convoy, and on November 3 arrived at Lintin Island, China.

Lintin, or Lintin Island, was some 60 or 70 miles from Canton, and lay at the mouth of Canton Bay, some 20 miles east-northeast of the Portuguese port Macao. All foreign vessels bound to Canton came to anchor at Lintin, where they remained until they procured from the Chinese custom-house near Macao a pilot and a permit to navigate the inner waters. Twenty-five miles from Lintin was the Bogue or Bocca Tigris, the mouth of the Canton (or Tigris) River. Near the Bocca Tigris was Chuenpe, the anchorage for foreign warships, and 30 miles from the Bocca Tigris, up the Canton River, was Whampoa, the anchorage for all foreign merchantmen. Here in the autumn and early winter months was to be seen one of the finest merchant fleets in the world, consisting of some 50 vessels and 3000 seamen. The foreign factories were some 10 or 12 miles farther up the river, just outside the walls of Canton. The foreign ships were unloaded at Whampoa, and their cargoes were transported to the factories by means of Chinese junks.

The chief official in Canton, the capital of the province of Kwang-tung, was the viceroy or governor, who was responsible to the Emperor of China, at Peking. Among the lesser officials were the hoppo or commissioner of customs and the poochingsze or treasurer and controller of the civil government. In accordance with the Chinese policy of commercial exclusion and national isolation, the officials at Canton held no direct intercourse with foreigners. A body of merchants, about 12 in number, called the hong or co-hong, acted as intermediaries between their government and the citizens and representatives of foreign governments. They were men of large means, owning extensive commercial establishments with numerous warehouses. They had a monopoly of the foreign trade, for which they paid their government large sums of money. They also gave security to their government for the payment of foreign duties and for the good conduct of the "barbarians" or "foreign devils" with whom they traded.

The factories at Canton in which the foreign merchants lived were owned by the hong. They occupied a space about a quarter of a mile square and consisted of a collection of substantial build-

ings, two stories high, constructed of either granite or brick, having verandas in front supported by pillars. Each factory consisted of five or more houses, separated by narrow courts. In front of the factories and between them and the river was an esplanade, 50 feet wide, allotted to the merchants for exercising, a recreation that was somewhat interfered with by the crowd of natives that choked up the esplanade—numerous barbers and fortune-tellers, venders of dogs, cats, quack medicines, and trinkets, and a host of sightseers come to gaze at the foreigners. Each factory displayed from a flagstaff erected in front of it on the esplanade the flag of the country of its occupants. Names intended to be more or less indicative of good fortune were given to the several factories. The American factory, for example, was called "the factory of the wide fountains." The foreigners were not permitted to enter the walls of Canton, a city of about a million inhabitants, nor could they reside the whole year at the factories, nor bring their wives there. As soon as the season of trade, lasting from September to March, was closed, they went to Macao, where their families lived.

Each foreign factory and each visiting ship was obliged to procure a compradore, that is a person qualified, according to Chinese customs, to furnish foreigners with provisions and other necessaries. The compradore charged extravagant prices, since to his own large profit he added a considerable sum for his government, which in this way derived an income from each ship, in addition to the regular duties. The transaction of business was often impeded by the officials, and the foreigners were subjected to numerous indignities. As the Occidental trade was highly profitable to the Chinese, they were pleased with the arrival of foreign merchantmen. They extended no welcome, however, to foreign ships of war, especially since the year 1816, when the British frigate *Alceste,* on being denied permission to anchor at Whampoa, disregarded the orders of the Chinese government and passed up the river, silencing by a few shots a fort and some junks.[31]

The arrival of the *Congress* at Lintin greatly alarmed the Chinese officials, and on learning of it they at once took measures

[31] Shaw, Samuel, Journals, 174-175; Yeats, J., Growth and Vicissitudes of Commerce, III, 537; Rushenberger, W. S. W., A Voyage Round the World, 393-394; Medhurst, W. H., China, 285.

to cause her to depart. Ah, the hoppo of Canton, issued the following order to the hong merchants, who communicated it to the American consul, Benjamin C. Wilcocks, who forwarded it to Captain Henley at Lintin:

An official document has been received from the acting Vice Roy to the following effect:

"On the 21st day of the 9th Moon of the 21st Year of Hea-King, the Tso-tang of Macao, Chow-seiheung, reported that on the 17th instant the Pilot Wang-Mow-Chang stated that on the 16th at 6 o'clock in the evening an American Cruiser, Henley, anchored at Ling-ting. On examining the said Captain, he affirmed that a great many of the ships of his country came to Canton to trade; that of late in foreign seas there were crowds for foreign pirates at every port and every pass, waiting to rob merchant ships which went and came; and therefore he had been ordered by his country to cruise every where and collect information, and now having a fair wind he had taken an opportunity to come hither to get information from the merchantmen of his own country, who had come to Canton. He now waited for the orders of the resident Chief Supercargo [Wilcocks], on receiving which he would take his departure. It is my duty to report these circumstances.

"The number of seamen on board is 350, great guns 50, muskets 300, swords 300, powder 800 cattas, balls 800 cattas.

"The affair being thus, I [the Tso-tang of Macao] (who hold a mean office) repaired in person in order to restrain and suppress the conduct of this vessel. I also wrote to the naval officer at Heang-Shan, and fled with the utmost expedition by a dispatch to inform the encampment at Cosa-branca and request them to select and appoint officers and men to go forth and keep guard with careful minds and not permit the said vessel to approach the inner waters. I (who hold a mean office) have examined and found out that the head of the soldiers on board the said vessel intends to enter the pass on board an English Company's ship (or an European ship). Since the said cruiser casting anchor at Ling-ting is a very different case from that of a merchantman and it is inexpedient to allow her to linger about and create disturbance, I therefore most respectfully request that an official communication be made to the Hoppoo that he may order the Hong Merchants to communicate authoritatively an order to the Chief Supercargo of the said country, urging him to give an order to the said cruiser to make haste and take her departure, that she may not linger about many days to create disturbance. The Tung-she of Macao and the Heang-Shan-heen have written to the same effect.

"On the above coming before me, the acting Vice Roy, it appears that as the said vessel is not a merchantman it is inexpedient to allow her to linger about and create disturbance. I therefore wrote to order the naval officer at Heang-Shan to send officers, men, and police runners to keep a strict watch on the said vessel and not allow her to approach the inner waters, and that she may make haste and take her departure, and go home to her own country; for she will not be allowed to linger about here and

create disturbance without involving herself in great criminality; and let the day of her departure be reported. I also write to the Poo-Ching-sye of Canton, to despatch an order forthwith to all the civil and military officers in the districts concerned to keep (in obedience hereto) a strict watch and guard on the vessel and press her departure. Further, I desire the Hoppoo to examine what is going on and to command the Hong Merchants to transfer an order to the Chief Supercargo of the said nation, to order the said vessel to make haste and take her departure, for she is not permitted to linger about here and create disturbance."

On this coming before me, the Hoppoo, I find that the Wee-Yeun of Macao and the Tso-tang both reported to me and that I have already ordered the Hong Merchants to enjoin the said nation's Chief to hasten and order the said cruiser to take her departure as appears on record.

I now transfer the above order to the Hong Merchants that they may enjoin the Chief of the said nation to order and urge the said cruiser to take her departure speedily and not linger about here to make disturbance. Let them moreover examine into the facts and report to me the appointed day for her departure.

Let them not oppose a special Edict.—Hea-King Ui Yein; 9th Moon 21st day.[25]

Henley paid no attention to these elaborate orders, knowing that they were harmless formalities, and that similar orders were regularly issued to all ships of war that entered Chinese waters and were regularly disregarded by them. His first object was to obtain refreshments for his ship. The difficulties that he encountered are set forth in his letters from Lintin to the Secretary of the Navy, from which the following extracts have been made:

Mr. Wilcocks, to whom we are indebted for his indefatigable perseverance in endeavoring to obtain for us a friendly reception from the Chinese Government, informs me, thro Mr. Danagh [the purser of the *Congress*], who was despatched to Canton shortly after my arrival at this place for the purpose of procuring supplies, that after a negotiation of several days and mature deliberation on the part of the Chinese Government, they have in violation of all the laws of hospitality refused to grant the ships a Compradore, or person to supply her with provisions; neither will they, with their knowledge or approbation, allow us to obtain them in any other way except on the condition of my assuring them that I would immediately after leave their waters, which proposition the nature of my orders would not admit of my acceding to; nor would I, except under the most distressing circumstances, been willing to have gratified them. In my last I informed you that I was then weighing anchor for the purpose of going up to Cheun Pee, the usual anchorage for ships of war, but upon my being informed by Mr. Wilcocks that the Chinese Government does not acknowledge Cheun Pee as an anchoring place for national vessels, I thought it

[25] Captains' Letters, U. S. Navy Dept. Arch., LXV, 90.

advisable to return to my former anchorage off Lintin Island with the hope of getting supplied with fresh beef and vegetables from these islands, as we have heretofore done in small quantities.

The Chinese, naturally of suspicious dispositions, and who from motives of policy have always entertained an aversion to ships of war coming within their territories, have been latterly roused to a greater aversion than formerly in consequence of Captain Maxwell of the British frigate *Alceste* having fired on their batteries and forced his way up the river to Whampoa, which has induced them to take such measures as to discourage all national vessels from coming within their territories. The British brig *Bacchus* having anchored at Cheun Pee with the expectation of getting supplies was surrounded by their armed junks, by which means they cut off all communication with her and would allow her no supplies whatever, in which situation she remained for several days, but getting very short of provisions was finally compelled to leave the country.

On the 20th of November I received a letter from Mr. Wilcocks (a copy of which I enclose marked No. 5), informing me that there were no hopes of getting the ship regularly supplied and advising my proceeding to Canton in an American merchant ship bound up. Altho I had at that time nearly completed my supply of bread, spirits, etc., I resolved to make another effort to have the *Congress* put on the same footing and to demand the same hospitality that had been heretofore extended to English armed ships previous to the affair of *Alceste*, and others. On the evening of the day that I received Mr. Wilcocks letter, I left my ship for Canton in the American ship *General Hamilton*, where I arrived on the morning of the 23d, and immediately had an interview with the head of the Hong Merchants, Hougua, who appeared extremely anxious to know our business here, the time of our intended departure, etc., etc., notwithstanding he had been repeatedly told by the Consul, and at the same time every assurance given him of the friendly disposition of the American Government, and that the protection of our immense trade was the only object that induced the President of the United States to send the frigate *Congress* to China.

I was tantalized with promises of being allowed a Compradore until the 2nd of December when I informed the Hong Merchants that I should address a letter direct to the Hoppoo in violation of their customs. To this they made some objections and requested that the communication might be made through the Consul, which was done on the 3rd of December, a copy of which (marked No. 4) together with copies of the different Chops, or orders, received by Mr. Wilcocks relative to the affair; for the translations of which I am indebted to Mr. Meneston, a gentleman who translates for the English East India Company. Since the Consul's communication to the Hoppoo (previous to which I feel convinced there had been no correct information carried within the Walls) they have, without making a reply, relaxed so far in their inhospitable restrictions as to allow the ship a Compradore, for which a Chop was issued on the 7th of December, since which time our supplies have been very regular, and I am happy to observe that the commotion which my arrival in China excited has considerably abated, and I am in hopes to leave them impressed with such

a knowledge of the pacific and friendly disposition of my Government towards them as to ensure to our armed vessels hereafter a more hospitable reception.[26]

Having obtained the desired refreshments, Henley, about the middle of January, sailed for Manila, where he arrived after a week's voyage. As the *Congress* was the first American ship of war to visit our future possessions in the East Indies, the following extract from a letter of her captain to the Secretary of the Navy, dated Manila Bay, January 22, 1820, is not without interest:

I have met with a very hospitable reception at Manila, one indeed which has far exceeded my most sanguine expectations. The Governor himself [Mariano Fernandez de Folgueras] professes the greatest friendship for us, and has tendered his services to render any assistance which I might stand in need of. Under these circumstances I deemed it a fit season to effect the repairs of my mizzenmast, which I informed you in my last had been found to be very defective. After representing its situation to the Governor and having received his assurances that every facility which a well established navy-yard could afford towards expediting it should be afforded me, I proceeded immediately to set it out and entertain the most flattering expectations of having it stepped again in a very short time.[27]

One of the subordinate officers of the *Congress* has also recorded his impressions of this visit to Manila:

Our reception here formed a striking and highly pleasing contrast to the very unfavorable one we had recently met with in the ancient, but uncivilized and inhospitable, country we had so lately left. The manner in which we were received by the Governor was peculiarly gratifying, not only to our national, but to our individual, feelings. The kindest offers of a public nature have been made to Capt. Henley, and the officers have been severally invited and welcomed to his house in the most hospitable manner. His example, however, has been followed by very few of the Spanish gentlemen; they, preserving in its fullest extent the proud and reserved character for which they are so noted, keep aloof and pay us little or no attention even in their own houses, where we often go to visit the ladies, whose polite attention amply compensates for the rudeness of the men.[28]

In March Henley returned to Lintin for the purpose of offering convoy to the American merchantmen about to sail for home. In the latter part of April he sailed again, and for 70 days cruised in the China Sea and in the neighborhood of the Straits of Banca, Gaspar, and Singapore, but saw nothing worthy of observation.

[26] Captains' Letters, U. S. Navy Dept. Arch., LXV, 30, 90.
[27] Captains' Letters, U. S. Navy Dept. Arch., LXX, 32.
[28] National Intelligencer (Washington), July 29, 1820.

After calling at Manila, he again returned to Lintin, where he arrived on September 9. Renewing its acts of inhospitality, the Chinese government denied him the service of a compradore and refused to issue an order for the transportation to Lintin of stores purchased at Canton. The viceroy did not deign to reply to a letter from Henley demanding for the *Congress* the same privileges that were granted to British ships of war. Finally, deciding on bolder measures, Henley weighed anchor at Lintin and sailed up the bay to Chuenpe, near the Bocca Tigris. This movement had the desired effect. Greatly alarmed, the hong merchants at once sent down the stores of the ship, and Henley was soon able to complete the preparations for his return voyage. Before sailing he offered to convoy the American merchantmen in China through the Dutch possessions, but they one and all refused the proffered aid, fearing to incur the hostility of the Chinese government by taking advantage of it.

Some recent commotions at Manila caused Henley to decide to stop at that port on his way home. It appeared that early in October the Filipinos had attacked the foreign residents of Manila and had murdered upwards of 30 of them. One American was killed, and the American consul narrowly escaped with his life. According to one account, the outrage was instigated by the priests, who induced the people to believe that the foreigners were the cause of the cholera then prevailing in the city. Another account traced the commotion to the native merchants, who, it was asserted, wished to evade their contracts with the foreigners to furnish sugar at certain specified rates, that article having appreciated in value after the contracts were made.

Henley found the city in great disorder, and business entirely suspended. Before he was able to render much assistance the cholera made its appearance on board his ship, and he was compelled to put to sea. After clearing the Straits of Sunda the disease was got under control, but not until 26 men had died with it. The crew suffered also from scurvy, the scourge of the sailing ships of the old navy. In a cruise of a little more than two years the *Congress* lost 68 men, almost 20 per cent of her complement. Among the dead was Lieutenant William Nicoll.

At Rio Janeiro Henley received on board his ship as a passenger to the United States, General Thomas Sumter, our former Minister to Brazil. A revolution was in progress at the Brazilian

capital, a small fleet was waiting to carry the King to Portugal, and Don Pedro was to be left in charge of the government. The city was "filled with people shouting for a constitution apparently without understanding what they wanted." The *Congress* arrived at Hampton Roads on May 29, 1821.

V.

THE CIRCUMNAVIGATION OF THE GLOBE BY THE "VINCENNES": 1826-1830.[28]

Four years after the *Empress of China* in 1784 rounded the Cape of Good Hope on her memorable voyage to Canton, the ship *Columbia*, of 220 tons burden, Captain John Kendrick, and her consort, the sloop *Lady of Washington*, of 90 tons, Captain Robert Gray, rounded Cape Horn and passed into the Pacific—the first American vessels to enter that great ocean. They were from Boston and were bound to the Northwest Coast, carrying assorted cargoes, which were to be exchanged for the furs of the sea-otter. After remaining on the coast for more than a year, they sailed separately in the latter part of 1789 for Canton by way of the Sandwich Islands. The *Columbia* arrived in China in November, and, after selling her furs and buying teas, she returned home by way of the Cape of Good Hope, reaching Boston on August 10, 1790—the first American vessel to circumnavigate the globe.

The first American merchantman to cross the Pacific from Asia to America was the little brig *Eleonora* of New York, Captain Metcalf. She sailed from Canton for the Northwest Coast about September, 1789, and arrived at Nootka Sound in November, being accompanied with a small schooner called the *Fair American*, which Metcalf had purchased in China and had placed under the command of his son, a youth of eighteen years. The voyage from our Atlantic ports, especially from Boston, around Cape Horn to the Northwest Coast and thence to China soon became a popular one, as it was exceedingly profitable. In September, 1790, the brig *Hope* sailed upon it, and she was soon followed by the *Columbia*, *Hancock*, *Jefferson*, and *Margaret*. Captain Cleaveland, in his journals, mentions four Boston vessels which he saw

[28] The chief sources of information for this chapter are Captain Finch's proceedings during the cruise in the U. S. sloop-of-war *Vincennes* and Masters' Letters, 1829-1840 (U. S. Navy Dept. Arch.), and C. S. Stewart's visit to the South Seas.

on the Northwest Coast in 1799, and says that ten others were to be dispatched thence during the season. In the course of half a century our merchantmen visited every part of the coast of the North Pacific and all the adjacent islands in search of the skins of the sea-otter, the seal, and other fur-bearing animals.

American mechantmen did not long precede American whalemen in the Pacific. The first cruising-grounds of our whalemen lay off the coast of the thirteen colonies. When they had exhausted the whales there, they sought new fields in which to ply their trade, passing, in the course of several centuries, from their home coasts to the West Indies, thence to the Cape Verdes, thence to the coasts of Africa and Brazil, and thence to the Falkland Islands and the east coast of Patagonia. Finally in 1791 six whalers from Nantucket and New Bedford rounded Cape Horn and began operations off the coast of Chile. These were soon followed by others, and the cruising-grounds were extended northward to the equator. By 1812 the region of the Gallapagos Islands was much frequented. In 1820 the "off shore grounds," latitude 5°-10° south, longitude 105°-125° west, were discovered, and about the same time the first American whalers made their appearance on the coast of Japan.

With the arrival of our merchantmen and whalemen in the Pacific, our trade with the ports on the west coast of South America began, and it gradually increased from year to year. In 1813-1814 Commodore David Porter, in the frigate *Essex*—the first American ship of war to round both the Cape of Good Hope and Cape Horn—protected our vessels in the Pacific and captured many British whalers. In 1821-1824 Commodore Charles Stewart established the Pacific naval station, with headquarters at Valparaiso and Callao, for the protection of our commercial and whaling interests in that ocean. Stewart was succeeded as commander-in-chief of the squadron by Commodore Isaac Hull, the illustrious commander of the *Constitution* and the captor of the *Guerrière*. In 1826 a new commander-in-chief was sent to the Pacific to relieve Hull, Commodore Jacob Jones, who sailed from the United States in September of that year with the frigate *Brandywine* and the sloop-of-war *Vincennes*. The latter vessel was making her maiden voyage, having been but recently launched. She was rated as a 16-gun sloop, of 700 tons burden, and carried 190 officers and seamen. Her commander, William Bolton Finch, entered the

navy as a midshipman in 1806, and became a lieutenant in 1813, a master commandant in 1820, and a captain in 1831. In 1819 he gained an unpleasant notoriety by killing Lieutenant Francis B. White, of the marine corps, in a duel fought on Castle Island, Boston Harbor.

In January, 1829, when Finch's tour of duty in the Pacific was drawing to a close, the Secretary of the Navy ordered him to return home by way of the Cape of Good Hope, after visiting various islands in the Pacific and ports of Asia frequented by our merchantmen and whalers. An extract from his orders will show the objects of his voyage:

> You will then proceed, after supplying your ship with the requisite funds in specie, provisions, and repairs, to the Society Islands touching at the ports in them where it is probable you will find our merchant and whaling vessels, and render to them all the assistance and protection of which they stand in need, or to which they may be lawfully entitled. You will make enquiry into the state, extent, value, and wants of our commerce, and cultivate with the Chiefs and authorities the best feelings towards our government, citizens, and interests. If you should find that our seamen are in the habit of deserting from their ships, you will use every effort consistent with a friendly deportment towards the natives to reclaim them and to persuade the Chiefs to discourage, by every means in their power, a practice injurious to our commerce and much calculated to impair the good understanding which we are desirous to maintain. It may be in your power to render important services to our maritime interests by removing a source of great annoyance and apprehension, if not evil and danger. Many inconveniences have been felt in some of the Islands from the presence of our fugitive sailors, and injury results to our shipping from the example held out for others to follow. It would be politic to adopt a conciliatory course towards them, should any be found, and by prevailing upon them to enter either on board the *Vincennes* or some merchant vessel, thus restore them to their country, to their friends, and to usefulness.
>
> You will remain a short time, as circumstances shall require, and thence proceed to the Sandwich Islands, visiting the port of Honoruru and any others where it may be of service to exhibit your force. The purposes of your visit to the Sandwich will be similar to those for visiting the Society Islands, and the same instructions will apply to both. Chaplain Stewart has in his care and will deliver to you a letter to King Tamehameha and a few presents from our Government to the principal Chiefs of the Sandwich Islands. You will deliver them to the persons for whom they are intended. Here you will remain from two to three weeks, or as long as shall be thought expedient, being careful during your stay to cultivate the most friendly relations and to procure from our consular and commercial agent and from other sources every information respecting our commercial and other interests which may be practicable.

After accomplishing these objects, you will resume your route to the United States, passing by the Cape of Good Hope, and stopping at the Islands of St. Helena or Ascension, or both, and at such other places as may be found convenient, [attending] constantly to the interests and wants of our countrymen, and procuring information which may be useful. After leaving the Sandwich Islands, if the wind and weather should permit, it will be useful for you to visit the port of Canton where our commerce is very valuable. As this will depend so much upon the state of the winds and weather, it must be left to your discretion.[30]

On July 4, 1829, Finch sailed from Callao, Peru, for the Society Islands. On his way he stopped at Nukuhiva, Washington Islands (a part of the Marquesas Group), which had been discovered in 1791 by Captain Ingraham, of Boston, and had been visited in 1813 by Commodore Porter in the *Essex*. About the middle of August he reached the Society Islands—first visited in 1826 by an American warship, the *Peacock*, Captain T. A. C. Jones—and remained there several weeks cultivating the friendship of the native chiefs. On October 1 he arrived at the Sandwich Islands. Here he delivered to the King the gifts and communication of the President and exchanged numerous civilities with him, the members of his family, and the officials of his government, winning the good will of all the residents, with the exception of the American merchants, who thought Finch partial to the missionaries. From some statistics collected by Finch we learn that 25 American merchantmen and 100 whalers, worth with their cargoes $5,270,000, visited the Sandwich Islands annually. The discovery of the whale fishery on the coast of Japan and the independence of the republics on the west coast of North and South America had greatly increased our commerce with these islands.

In the latter part of November the *Vincennes* sailed from Honolulu for China. She passed through the Ladrone Islands, but probably not near enough to Guam to give her crew a sight of that future possession of America. "On the evening of the 19 inst." (December), wrote Chaplain C. S. Stewart of the *Vincennes*, "we passed the most northern of the Ladrone Islands, between Pagan and Agrigan, at a distance of 15 or 20 miles. Both lofty islands, the last so much so as frequently to be seen at a distance of sixty miles. It was near night when we descried them, and nothing but a dim outline was to be seen against the sky."[31] After

[30] Letters to Officers of Ships of War, U. S. Navy Dept. Arch., XVIII, 219.

[31] Stewart, C. S. A Visit to the South Seas, II, 289.

a tedious passage of 39 days the good ship anchored at Macao, where Captain Finch was hospitably received by the acting consul of the United States, Mr. C. N. Talbot, and by Dr. Bradford, formerly of Philadelphia. Chaplain Stewart was entertained by Dr. Robert Morrison, for many years the only Protestant, English-speaking missionary in China, and Chinese interpreter for the British and American residents. The officers of the ship received many kind attentions from the merchants, and especially from the chief representatives of the British East India Company. A party, consisting among others of Captain Finch, Chaplain Stewart and Midshipmen M. F. Maury and Stephen C. Rowan, visited Canton.

Soon after the arrival of the *Vincennes* at Macao, Finch addressed a letter to Consul Talbot and Messrs. J. P. Sturgis, Samuel Russell, J. R. Latimer, and W. H. Low, American merchants, asking for information respecting the trade between the United States and China and the advisability of periodical visits by our warships to Chinese waters. Their reply gives in brief form a statement of our commercial relations with China in 1830:

> We are fully aware of the kind intentions of the general government in permitting the present visit of your ship of these waters, and feel particularly obliged to you for the communication now under consideration, and for the interest it evinces for the prosperity and protection of our trade. Was time allowed previous to your departure to prepare the documents necessary to reply to your communication as we should wish to do, we have no doubt but what we could exhibit to the satisfaction of yourself and the general government the great advantages to our commerce which would be derived from occasional visits by our vessels of war, attended, as they would be, by increased respect for our national character. We will however briefly observe that the commerce of the United States with China is at present on a favorable footing. We have many local grievances and impositions to complain of, practiced by the local Mandarins in contravention of the known laws of the Empire. These we suffer in common with other nations. [There are] other grievances, delays and impositions peculiar to our flag which are vexatious, but of so petty a nature that we have no doubt they would be promptly redressed on remonstrance at any time, if attended with the presence of a vessel of war. Hence we feel no hesitation in assuring you that it is not only our wish to have frequent visits by our national ships, attended as we believe they would be by benefit to the commerce of this port; but that our national character would be elevated in the estimation of the whole Chinese Empire and the neighboring governments, and that especial care would be observed by all not to encroach on our rights, knowing that the power to protect the very valuable commerce of our country was at hand to appeal to, and that the appeal would not be made in vain.

The American trade from all parts of the world centering in the port of Canton fluctuates in value of imports from five to seven millions of dollars annually, with like exports. We have one year with another from forty to fifty ships in the port. And it is frequently a source of anxiety and disquietude to us to hear of armed vessels of doubtful character cruising in the tracts of our ships, which from their pacific character are without the means of defence themselves, nor any where to look for that protection so valuable a commerce demands.

The fact of your visit, brief as it is, will be known throughout China and the whole Indian Archipelago. Should it be followed by those of other armed vessels observing the same deference towards the customs of China and conciliatory disposition as exhibited by yourself, they will in our opinion increase the respect for our flag, enable us at all times to resist impositions with effect, and have a moral influence on all the inhabitants of the various coasts and islands in the route of our merchant ships.

The season for visiting China may be left at the pleasure of the general government. Our season of business extends from September to March, which would be the best for obtaining supplies, for the health of the crews, and of importance to the commercial interests. At all times provisions can be obtained by a short delay. And generally the shipping of various nations have an excess of provisions which might be had without any delay. The visits would be most influential if made annually, and of short stay in the water of China, visiting Manila and proceeding through the seas and straits usually frequented by our ships.

Men of war visiting China are precluded by law from entering the port. They should not come up higher than Lintin where there is perfectly good and safe anchorage. In a few days after their arrival is reported, licenses are granted and an abundant supply of provisions will be furnished by a licensed compradore. The well known character of American officers will preclude the supposition that any interruption to the trade can arise from their non-compliance with the customs of the country.

We are decidedly of opinion that the fostering care of the general government for the protection of commerce cannot be extended to one of more importance than the China trade, and that the occasional visits by vessels of war will be attended with the most beneficial results.[28]

After a brief stay at Macao, Finch sailed for Manila, where he arrived on January 29, 1830. He was courteously received by Senor Mariano Ricafort, the captain-general and governor of the Philippines. The American merchants residing at Manila were of the opinion that occasional visits there by our warships were desirable. Some impressions of Chaplain Stewart, written during his stay at the Philippine capital, constitute one of the first descriptions of the city and its environs from an American pen.

[28] Captain Finch's Proceedings during His Cruise in the U. S. Sloop-of-War *Vincennes*, January 14, 1830.

On the morning of the 26th inst., we descried the Island of Luconia, or Lucon, at a point fifty or sixty leagues north of the entrance of this bay; and for the two days following coasted its shore, under the alternate influence of a land and sea breeze, with the outline of a mountainous and finely variegated country in full view.

The bay of Manilla is very extensive, ninety leagues in circumference, and the city situated on its southern shore, some twenty or twenty-five miles from the sea. We dropt anchor in our present berth early yesterday morning; and are surrounded by varied and beautiful scenery. The circuit of the bay is too wide to allow of distinct views of most of its shores; but the outline of the lofty hills and mountains, sweeping round it, is traceable at most times against the sky—giving to it, as a whole, much the appearance of a noble lake.

The view of the city, however, its suburbs, and the adjoining country on either side, and far inland, is full and imposing. The city itself, inclosed by walls of dark stone, and surrounded by a broad moat, lies on the north side of the river Pasig, which here flows into the bay, while the suburbs, containing a tenfold population, lie across the same stream on the north. The aspect of the two sections presents a striking contrast. The dark, moss-covered walls on the one side—screening every thing from sight except the red tile of the roofs of the houses, and the towers and domes of the cathedral and churches—stretch a half or three quarters of a mile along a green bank and carriage-drive by the water's edge; while on the other, in place of heavy walls, bastions, and embattled towers, nothing is to be seen, as far as the eye can reach, but a mass of huts of bamboo and reeds, of the slightest construction and rudest aspect, embowered in groves of the greatest luxuriance and verdure. The location both of the city and suburbs is very low—a characteristic of the surrounding country; but some miles inland it becomes more elevated and broken, and terminates at last on every side in lofty and beautiful mountains.

G. W. Hubbell, Esquire, consular agent of our government, waited early upon Captain Finch and his officers, with a tender of the hospitality of his house; and it is arranged that the captain, purser, surgeon, and myself, shall take up our quarters with him during our visit.

My friend Lieutenant Magruder accompanied me on shore at two o'clock to dine at the consulate and to take a first glance at the city. The landing is by the river, a narrow and rapid stream, with a lighthouse, small and of imperfect service, at its mouth on the suburb side. A long mole of granite, with a circular battery at the end, lines the river on the same side with the city; immediately on passing which we perceived a greater stir of business than is seen from the bay, the river being crowded on the side adjoining the suburbs with numbers of vessels of various burdens and covered with boats, plying rapidly in different directions. The walls of the city rise from the water, and extend more than half a mile up the stream to a fine stone bridge, affording the only communication by carriages with the suburbs. Besides Mr. Hubbell, we found at the consulate Mr. King, a young gentleman of intelligence and piety, attached to the

establishment, and Captains Chever and Benjamin, the commanders of two American merchantmen, at present in port.

The support of an equipage here is attended comparatively with so little expense, that it is not customary to walk, either on business or for pleasure; and after dinner, at five o'clock, four carriages were in readiness for the whole party, with the addition of Mr. Stribling [Lieutenant C. K. Stribling], from the ship, to take an evening airing. The usual vehicle is a light, low phaeton, handsomely finished, drawn by two small, but fleet horses, under the management of a postillion on one of them. The rides in the vicinity of the city are varied, and of a degree of beauty almost unrivaled; but that most resorted to in the evening is a broad road lined with a double row of trees, commencing at the bridge and following the course of the moat and glacis surrounding the city wall to the beach, and extending along it in front of the city, with an open view of the bay and shipping. Here all the rank and fashion of the place assemble for an hour or more every evening, presenting an animated and truly beautiful spectacle, as equipage after equipage rolls along in a double line—one passing in one direction and the other in another—affording a full view, from the open carriages, of all the dress and beauty of the first circles of society. The ladies wear neither hats nor mantles; but, according to the Spanish custom on such occasions, appear in full evening costume.

This drive is called the Calzada. It is open entirely to the country on one side, and leads past the public parade ground, near the bay. The standing forces of the government consists of 12,000 troops, all natives of the islands, commanded by Spanish officers. Five thousand of these are quartered in the city, and the remainder in various parts of the group. There is a regular evening drill; and about two thousand were now under arms. They made a fine appearance; are well dressed, well paid, and it is said, are loyal and firm in their attachment to the Spanish authority. Two full bands were performing, and I have no where heard finer martial music, though all the musicians, like the soldiers, are native indians of the country.

The airing and the drill usually terminate together—the carriages, when the troops begin to move, changing the rapid rate, at which for the hour previous they are whirled from one end of the Calzada to the other, to a walk, for the enjoyment of the music to which they march, till dispersed at the barracks near the bridge.

Two evenings in each week the military bands perform for an hour in the palace square within the city, in front of the residence of His Catholic Majesty's representative, the Captain General and governor of the Philippine Islands, at present the Senor Rocafuerte. This was one of the evenings; and we drove into the city to share in the entertainment. It is a well built, neat, and quiet town, containing a population of twenty thousand, principally Spanish, or of Spanish extraction; officers of government and of the military department; priests, soldiers, etc. The streets are regular, and well kept, and the whole style of building that which I have described as prevailing in Lima—the Moorish quadrangle of two stories,

with covered balconies from the second story over the street and corridors within. Here the balconies, instead of lattice work of dark wood, consist of large sashes, to be thrown open at pleasure, set, in place of glass, with the inner shell of a large muscle, which, prepared for the purpose, is translucent, transmitting the glare of a tropical sun, in a mellowness of light equal to that passing through ground glass.

The houses of the foreign residents, and of the more wealthy inhabitants of the suburbs, are in the same style of architecture; the first story being appropriated to storehouses, kitchens, offices, stables, etc.; while the second is occupied by spacious and lofty saloons, and sleeping and dressing apartments.[33]

On February 9 Finch sailed from Manila on his homeward voyage, and 56 days later anchored abreast of Cape Town, having stopped only in the Straits of Sunda, to water his ship. He was cordially received by the representatives of the British government in Africa, and later by the British officials at St. Helena, at which island he spent several days, giving his officers an opportunity to visit the tomb of Napoleon. On June 8, 1830, he arrived at New York, having circumnavigated the globe—the first commander of our navy to achieve this distinction, and the second to visit China.

[33] Stewart, C. S. A Visit to the South Seas, II, 299-304.

(TO BE CONTINUED.)

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

WILKES' AND D'URVILLE'S DISCOVERIES IN WILKES LAND.

By REAR-ADMIRAL J. E. PILLSBURY, U. S. Navy.

In January, 1840, two National Expeditions were in the Antarctic, one the United States Exploring Expedition, consisting of four ships, the *Vincennes, Peacock, Porpoise* and *Flying Fish,* under the command of Lieutenant Charles Wilkes, U. S. Navy, and the other a French Expedition, consisting of *L'Astrolabe* and *La Zélée,* under command of Capitaine de Vaisseau M. J. Dumont d'Urville.

It has generally been accepted by foreign authorities that d'Urville sighted the land of the Antarctic Continent which he named Adélie Land on the same day (January 19) that Wilkes discovered land four hundred miles to the eastward which he named Cape Hudson, and also that d'Urville's Côte Clarie in longitude 131 East was sighted by him the day before it was seen by Lieutenant Ringgold on board U. S. S. *Porpoise.*

Investigation shows that both of these assumptions are in error and in fact d'Urville first sighted Adélie Land the day after Wilkes sighted Cape Hudson, and he sighted Côte Clarie the same day that it was sighted by Ringgold, but at a later hour. The story of the investigation which led to these conclusions will be given in the order in which it was made.

In d'Urville's narrative it is stated under date of *January 29* that at 4 p. m. he sighted one of the ships of the American Expedition (the *Porpoise*) and he "hoped that she intended to speak us." Through a misunderstanding of the manœuvering of the French flag-ship, Ringgold thought d'Urville wished to avoid a meeting, and although but "a cable's length distant" from the ship, he put his helm up and stood off to the southward.

Ringgold states that at 4 p. m., *January 30,* he sighted two ships which afterward proved to be the French vessels. He approached them "within musket shot" when to his surprise he saw them making sail, whereupon he hauled down his colors and stood off before the wind.

The discrepancy in dates was not noticed in reading the narratives but, wishing to see just where the meeting of the ships took place, their tracks were plotted on the same chart, when it appeared that the noon positions (d'Urville's January 29, and Ringgold's January 30) were near each other, and that the tracks crossed in the afternoon.

The discrepancy in dates seems to be remarkable, since both expeditions had crossed the 180th meridian from east to west some months before and had sailed for the Antarctic, one from Hobart Town, Tasmania, and the other from Sydney, Australia, where the dates must have been identical.

We find in Wilkes' narrative, volume 2, page 159, this statement: "On crossing the meridian 180° we dropped the 14th of November, in order to make our time correspond to that of the Eastern Hemisphere, to which our operations were for some months to be confined."

That d'Urville made no change of date in crossing the 180th meridian but maintained the same chronology appears from d'Urville's narrative, "Routes des Corvettes," volume 1, page 134, where, under date of October 13, 1838, the longitude is given as 179° 31′ West, and on page 136 under date of October 14, 1838, it is given as 178° 53′ East. He therefore made no change of date in crossing the 180th meridian, as otherwise the second date would have been October 15 instead of October 14.

Further investigation of d'Urville's daily positions shows that every day is accounted for until June 22, 1840, which appears in volume 1, page 340. On page 342 appears the date of June 24 with an asterisk, and at the bottom of the page is this note:

"Nous reprenons la date d'Europe,"

so that the date he dropped was June 23, 1840, five months after the visit to the Antarctic, and more than 20 months since he crossed the 180th meridian.

This means that in d'Urville's narrative of his discoveries and on the chart of his Antarctic voyage every noon position must

have its date advanced one day in any comparison to be made with the noon positions and the discoveries of Wilkes' ships.

Wilkes believed that he sighted the Antarctic Continent on January 16, 1840, at about 158° East longitude. On January 19, however, he states that "land was now certainly visible from the *Vincennes* both to the south-south-east and south-west, in the former direction most distinctly. Both appeared high," etc.

D'Urville says in volume 8 of his narrative, under date of January 19 (which should be January 20 to correspond to Wilkes' time), "At 9 a. m. we saw in the E. S. E. a great black cloud which seemed stationary and had the appearance of a raised island." "Toward 3 p. m., M. Gervaize, who was officer of the watch, thought he saw once more an indication of land in the east." "At 10.50 p. m., this luminary (the sun) disappeared and showed up the raised contour of the land in all its sharpness." This land on January 21 (true date 22) he named Adélie Land.

Returning now to the meeting of the *Porpoise* and the French vessels: On the day following the meeting d'Urville reports: "At 6 o'clock the man on lookout had sighted the ice pack to the south and I brought the ship to the wind in order to go nearer to explore it; at 10 o'clock we were not more than three or four miles distant. It appeared prodigious. We saw a cliff with a uniform height of 100 to 150 feet, forming a long line westwards," etc.

It will be noticed that at 6 o'clock the *ice pack* and not the *barrier* was sighted.

Wilkes' narrative of the movements of the *Porpoise* for this day states: "The beginning of the 31st the gale continued; at 7 a. m. moderating, they again made sail to the westward; in half an hour discovered a high barrier of ice to the northward with ice islands to the southward; at 10 a. m. they found themselves in a great inlet formed of vast fields of ice which they had entered 12 hours previously; the only opening appearing to the eastward, they were compelled to retrace their steps, which was effected by 8 p. m." "They now found themselves out of this dangerous position, and passing the point, kept away to the westward."

"*February 1.*—The immense perpendicular barrier encountered yesterday was now in sight, trending as far as the eye could reach to the westward," etc.

The *Porpoise*, therefore, at 7.30 a. m., January 31, was in the entrance of the great inlet on the southeast side of d'Urville's "Côte Clarie" and had sighted the high barrier of ice, the northern side of which d'Urville reached about 10 o'clock the same forenoon.

It is established from this investigation that, even if Wilkes' sighting the Antarctic Continent on January 16 is not admitted, it is certain that he did sight Cape Hudson a day before d'Urville sighted Adélie Land and that Côte Clarie was sighted by the *Porpoise* on the same day that it was seen by d'Urville, but at an earlier hour.

Wilkes cruised along the coast of this continent for more than 1600 miles from his first landfall. Future exploration may, and indeed probably will, find that much of the land discovered by him was placed too near the barrier, or in other words too far north, for it is well known that distance estimated by the eye is liable to great error, and particularly is this the case in the polar regions.

Whether this proves to be so or not, this investigation establishes Wilkes' priority over d'Urville. The English sealer Balleny, in 1839, got a glimpse of land in about 121° East, but all he says regarding it is, "Saw land to the southward." Neither d'Urville nor Balleny had any notion or made any suggestion that they were on the edge of a continent. Wilkes, on the contrary, not only sighted at frequent intervals some 1600 miles of this coast but he recognized that it must be part of a continent. The name he gave to this land, the Antarctic Continent, must belong to the entire continent the existence of which he revealed. Some geographers have recognized that the part of Antarctica he discovered needed a special name and therefore gave it the name of Wilkes Land. When it is remembered that Wilkes changed the conception that the Antarctic was an ocean, by demonstrating that it was a continent, the least that his discoveries demand is that the name of Wilkes Land be retained on all of Antarctica lying between the longitudes of 95° and 158° East.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE DESTROYER—OUR NAVAL WEAKNESS.

By LIEUT.-COMMANDER YATES STIRLING, JR., U. S. Navy.

A great deal has been both said and written upon the question of our naval preparedness. Always the controversy has hinged and centered about the number and size of our battleships. These monster dreadnoughts have so filled the mind that we have hypnotized ourselves into believing that such war ships are invulnerable. We arm them each with a dozen 12-inch guns and nearly a score of 5-inch guns and are quite sure that we have launched forth a warship ready to fight any enemy

That we have omitted from this vessel something vital to its defense no one apparently has considered, or if they have but little noise is being made about it.

No one in his sober senses would send the *Florida* or the *Utah* out to fight without its 12-inch guns or even without its 5-inch battery, yet we would send these ships out to fight, if war should come, with something lacking which is just as important to its existence. There will be lacking something which in commercial life everyone knows is necessary. Would we dream of locking up a ten million-dollar bank for the night and leave it unguarded until morning, without protection from the attacks of robbers or the invasion of fire? The numerical strength of these night-watchmen depends directly upon the known frequency of bold robberies in the neighborhood or strictly speaking the quantity of daring robbers operating.

The *destroyer* is the night-watchman for the battleship, and the number necessary to safely protect it depends directly upon the known number of attacking torpedo vessels available for use by a possible enemy.

For those who have not followed the evolution of the *destroyer* a short historical sketch will be attempted before setting forth a

few arguments to prove its necessity as a component part of a fighting fleet.

At the inception of the steam epoch the automobile torpedo began its slow process of development. This development was from the start a steady growth. First, the range of the weapon was scarcely more than a few hundreds of yards. Not so long ago that we can all remember it was barely 500. In its early stages it was not considered a weapon of accuracy, rather the reverse. It was thought by many to be more dangerous to friend than foe. The torpedo-boat was the next and natural step in its development, for a small vessel was necessary and one having high speed to carry out the supposed visionary aims of the torpedoists—to be able at night to approach within the danger area of the torpedo it carried before the big ship could discover its presence. These small craft of necessity were speedy. They were small because it was necessary to approach very close before the weapons they carried could be used. The visibility range of a search-light at this time was about 1500 yards, and the torpedo-boat's aim was to get as close as possible before being discovered and then its speed would help it to remain under fire a minimum time before it brought it to torpedo range.

The torpedo-boat first made its appearance as an adjunct to the fleet in about 1886. Its displacement at this time was less than 100 tons, and its speed about 20 knots an hour. From this time on it gradually increased in size and speed until in 1896 the torpedo-boat displacement was slightly over 125 tons and its speed about 23 knots.

The next evolution was the *destroyer*. This new type of vessel became necessary, for even at this time the dangerous character of the torpedo-boat was recognized; armed as it was with at most an inaccurate weapon. In the war between Chile and Peru in the eighties, the possible danger of the torpedo was pointed out, and during the revolution in Chile in the early nineties a battleship fell a victim to a torpedo fired at night from a large torpedo-boat. During the Japanese-Chinese war in the middle nineties, torpedo-boats were freely used by the Japanese; no results, however, were accomplished worthy of note. Many torpedoes were fired but few, if any, serious hits were made. In our war with Spain the torpedo received a great blow. Not because of the fault of the materiel, but because of the woeful

lack of initiative displayed by the Spaniards, and on our part, by the stringent orders from the Navy Department to our few torpedo-boats to take no unnecessary risks. In the war between Japan and Russia, fresh in the memory of everyone, much damage was done by the Japanese torpedo-craft and much more might have been accomplished if the Japanese had been willing to risk the destruction of their small attackers. At the first part of this war Japan was forced to husband her resources for there was a second enemy's fleet at home which had to be taken account of. In the final battle, when the second Russian fleet was destroyed the water was too rough for these small vessels to accomplish much more than a few brilliant but fruitless dashes at the enemy; some in broad daylight. However, the usefulness, nay the necessity of the *destroyer* was clearly demonstrated.

After this war opinion was crystallized upon the subject of the *destroyer*. Naval men fully appreciated the injurious moral effect upon the crews of the big ships which were as matters stood at the mercy of a well-timed and planned attack in force by a flotilla of torpedo-craft. The salvation of the big ship lay first in the destructive power of its small guns aided by several more or less inefficient search-lights to illuminate the torpedo-boat after its discovery; second, in the effectiveness of the torpedo nets carried by many of the ships; and third, in the known inaccuracy and erraticism of the then existing torpedo.

The duty of the *destroyer* was to run down the attacking torpedo-boats and sink them with the fire of their small rapid-fire guns. The *destroyer* was also armed with torpedo tubes in order that it might be used as an attacking torpedo vessel; but its main function was to defend the battleships at night.

The naval student at this time was quite sure of the correct destiny of these two types of torpedo vessel. The smaller he classed as a weapon of defense—to guard the home coast from raids by the enemy's major warships. The larger he called an offensive weapon—to destroy the smaller defensive type and allow the capital ships to perform without peril their duties of blockade and similar war measures upon the enemy's hearthstone.

The above definitions are somewhat confusing, and perhaps need a closer explanation. The torpedo-boat in being a weapon of defense became in the hands of daring defenders a dangerous weapon of offense. It could issue forth from its hiding places in

shallow waters, seek out and attack the enemy's battleships and cruisers. The *destroyer,* on the other hand, being a weapon of offense, remained with the attacking fleet and in the attacks of the torpedo-boats on the fleet became a weapon of defense; guarding the helpless capital ships at night from the rushes of their small antagonists.

As the years went by the accuracy and range of the torpedo vastly improved until to-day the latest torpedo has a range of from four to six thousand yards, and its accuracy is sufficiently true to make it distinctly a dangerous antagonist. The torpedo-boat has gradually increased in size to make it more seaworthy and habitable; for as the range of the torpedo increased the necessity for diminutive proportions to prevent an early discovery lessened. The latest of this type are of a displacement of about 250 tons and with a speed of 26 knots. It can be readily understood that on a dark night a craft of this tonnage painted a dark green and approaching bows on might well be able to reach a distance of 5000 yards of an enemy's fleet without it being any the wiser, though the ships of the fleet be equipped with the most modern and high-power search-lights.

Again, if the size of the torpedo-boat is increased the *destroyer* must follow suit if she is to fulfill her destiny. The tonnage of this type of vessel, however, has been determined by the particular strategic and tactical duty of the fleet with which it will serve. In our own case, it must keep the sea for weeks at a time if it is to accompany the battle fleet. It must be large enough to carry coal and stores for these long intervals, and besides be fairly habitable for its crew. Thus our latest *destroyers* have a tonnage of nearly 1000.

As it will be seen the *destroyer's* destiny to-day is the same as that given by those who first evolved it with the additional duty of engaging and destroying similar vessels of the enemy and also to attack as a torpedo-boat. In other words the *destroyer* has merged into a large sea-keeping torpedo-boat, useful both for offense and defense. Offense against the enemy's battleships and defense against the attacks of its sisters in the enemy's ranks.

THE BATTLESHIP'S POWER OF DEFENSE AGAINST THE ATTACK AT NIGHT OF A DESTROYER OR TORPEDO-CRAFT.

The modern battleship carries from eight to ten search-lights of from 30 to 36 inches in diameter. These lights can, under the

most favorable circumstances, discover an attacking *destroyer* at a maximum distance of about 5000 yards. It will be noted that the discovery will take place *within the range of the modern torpedo.* After discovery the battleship has for its protection a score or more of light guns ranging in calibre from three to six inches. In the latest ships this calibre is the 5-inch. The guns are so divided that all directions are covered with its share of guns. The main battery guns are not intended to be used at night against torpedo-craft. There are two good reasons for this: the first being that the interference of smoke is great, and the second and better reason is that sufficient ammunition cannot be carried. The number of torpedo-craft that can be fired upon by a single battleship then will be equal to the number of search-lights available for illumination. If one more boat is attacking than the battleship has search-lights then that boat can attack absolutely *not under fire.* It will be noted that one of our battleships armed with but eight search-lights would fare badly if it were attacked, when alone, by a flotilla of ten *destroyers.*

THE ACCURACY OF GUN FIRE AT NIGHT.

The best understanding of this can be had by a study of gun fire in the day of which there is some authentic data, and then by a simple common-sense application we can arrive at what seems probable at night.

In the day time at a distance of from five to six thousand yards, the range known as accurately as the perfected range finders will give, the Japanese battleships and cruisers, firing under the most favorable conditions, that is being practically not under fire themselves, for the Russian accuracy was deplorable, managed to make, according to the most optimistic reports, about 10 per cent of hits on the *hulls* of the opposing fleet with the large calibre guns. Guns vary in accuracy almost directly with the calibre; therefore guns of three inches in calibre might be expected to make, if firing under like conditions, about 2.5 per cent, and the 5-inch guns about double this percentage. Now, at night, the range is only a 1000 yards less and absolutely *unknown,* and the target, instead of being of the area of a battleship, is that of a sharp-bowed, lean-flanked *destroyer.* Instead of the target standing out distinctly against the horizon it is feebly illuminated by a search-light almost at the latter's extreme limit. Instead of being

wakeful and steady the gun-pointer and gun's crew have just been awakened from their sleep. Is it possible with such conditions to make even one-half of the above percentages? My estimate would be less than half of that again. Picture the suddenness of a torpedo attack. The alarming, nay more, terrifying intelligence that a flotilla of *destroyers* is attacking. At night everything is changed; brave men are often cowards at night. Then the bungling of the search-light operators in their anxious haste to find the dreaded enemy so that their gun-pointers may see to shoot. The terror in the gun-pointer's eye, mistaking the splashes of his own shell for the enemy whom he had seen but a moment before. Taking all in all a fair estimate would be one-half of one per cent. This will mean that 200 shots will have to be fired at each attacker before even one hit per *destroyer* is made, and even this hit may not prove mortal.

In other words, a battleship cannot safely defend itself at night against the attacks of torpedo vessels. That this is true is not a new theory; all naval men of whatever nationality understand it, and all see that safety lies alone in the *destroyers* that will accompany the battle fleet in time of war. How many *destroyers* will be needed for this duty cannot be calculated mathematically, much depends upon the energy and intelligence of the personnel of the enemy and also upon the same factors in our own personnel.

It would, however, be interesting to see how many of these vessels other nations believe are necessary, if the number of *destroyers* per battleship and armored cruiser of their offensive fleets can be taken as a logical criterion.

TABLE I.

Country.	Battleships.	Cruisers.	Destroyers.
England	33	19	119
Germany	25	10	96
Japan	14	15	62
France	15	14	58
Italy	11	..	27
United States	24	10	36

The above table is taken from the latest available information at hand and excludes all old types which would not be used in the first line of battle.

TABLE 2.

Country.	Number of Destroyers per battleship and armored cruisers.
England	2.3
Germany	2.7
Japan	2.1
France	2.0
Italy	2.4
United States	1.0

The above is a very poor showing for the United States.

Again, many hold that all the available sea-going *destroyers* should be with the battleships and that the armored cruisers must take their chances against the enemy's destroyers; this seems quite logical for an armored cruiser is not in the true sense of the word a capital ship and if sunk or disabled, although perhaps, embarrassing to the commander-in-chief would not "count in the news of the battle." Lord Nelson never even mentioned the loss of a frigate which is the prototype of the armored cruiser of to-day.

With this assumption our figures will change:

TABLE 3.

Country.	Number of Destroyers per battleship.
England	3.7
Germany	3.8
Japan	3.7
France	3.9
Italy	2.4
United States	1.5

The United States is at a great tactical disadvantage until the Panama Canal is built and even afterwards due to the great distances necessary for the *destroyers* to steam in order to carry out a war against a possible enemy.

This disadvantage is met in our latest *destroyers* by giving them a large steaming radius. To give them this radius of action the size and cost of the *destroyer* has been greatly increased and the speed made moderate thus allowing more space for coal. The latest class will not be called upon to do greater than 30 knots.

England, Germany, France, Italy, and Japan on the other hand, if they must fight will fight very likely near their home

base and can utilize all of their *destroyers* and even their larger torpedo-boats. Thus we see that the United States is even more handicapped than appears in the above tables.

From the above it is seen that the countries worthy of being reckoned with as formidable naval powers have hit upon the figure two per capital ship (battleship and armored cruisers) with an extra allowance made for casualties—*destroyers* under repairs or disabled—and 3.7 per battleship alone.

When the Atlantic fleet left San Francisco on its trip around the world and its return to the Atlantic coast many laymen were skeptical of its avowed peace mission; yet it was as plain as day to every officer in the fleet. The fleet would never have been sent out helpless if there had been the remotest chance of war with a foreign power, and that it was helpless was only too well understood. It is true that there were five *destroyers* in Manila Bay which might have joined the fleet upon its arrival there, but these five would not have been a drop in the bucket and could not have been depended upon to guard the fleet and the nation's honor during the night. This was the *sign* of peace heralded far and wide and all the nations understood. When it left Hampton Roads, Admiral Cone and his flotilla of *destroyers* went with it; this voyage was not a war move, yet the fleet went prepared; not well prepared, but the Navy Department did the best it could under the circumstances. Every available *destroyer*, seaworthy to make the cruise around South America was sent to join Admiral Cone. With the addition of the *destroyers* on the Pacific and in Manila Bay the fleet would have been as well guarded as was possible with our limited number of *destroyers*.

On the other hand, we are going to the other extreme in building submarines. These craft are entirely for the defense of our shores. The submarine has no real tactical value unless the enemy is on our coast. It cannot accompany the battle fleet; it may, however, be used with the second line of defense or be held as a potential threat to an enemy who shows signs of molesting the tranquillity of our homes.

That *destroyers* are vitally needed appears only too plainly, and that we *all* have not awakened to this injurious omission in our naval budget is to be deplored. The Navy Department has asked for a few *destroyers* each year; and suddenly awakening to the urgent necessity in 1907, five were ordered and again in

1908 ten more, and then in 1909 six more, but this year the few recommended were stricken from the appropriation bill.

It is just as unwise a policy to take the torpedo-defense guns and search-lights off the capital ships of the fleet as to refuse to give our vessels the *necessary destroyer* protection. Without it we cannot hope to be successful against an enemy who is well prepared. The personnel of our ships would be soon worn to a frazzle through anxious watchings during the long dark nights, while the enemy could be peacefully sleeping, secure in the knowledge that for each battleship and cruiser of their fleet two or maybe four lynx-eyed *destroyers* were watching for the torpedo-craft of the enemy.

If a fleet is to be denied this necessary and really vital protection, the night-watchmen as it were, it would really be far better to take off the search-lights and torpedo-defense guns of small calibre, and thus be sure that the capital ships will not herald their position far and wide to a seeking flotilla of the enemy's *destroyers*. If the fleet remains dark the flotilla may miss them and if the fleet is discovered by the enemy's *destroyers* after driving off our few guardians it will be so close that with a large field night-sight the gun-pointer can probably shoot as accurately as if his target were illuminated by a search-light.

It will be seen that in order to have the calculated quota of *destroyers* by the most conservative estimate, table 2, 28 must be added immediately to the navy list and for each capital ship built there should be built to protect it against night attacks two high speed sea-going *destroyers*.

If we go to the extreme, however, and take table 3 as the true necessity then we should build at once 53 large type sea-keeping *destroyers* to be the night guardians of the 24 battleships composing our first line of battle.

Every weapon of war has its pessimists. Those who will not take seriously the modern torpedo are many. They scoff at its accuracy and call it a weapon of danger to the ship firing it. The optimist on the other hand goes to the other extreme and claims for it more than it really deserves. The conservatist, however, considers it merely a weapon of chance and has figured its value mathematically.

Suppose a fleet of 24 battleships is cruising at night off an enemy's coast. Imagine this fleet to be without guarding *de-*

stroyers. The fleet's formation is in two columns the distance between these parallel columns being 1600 yards. The distance between single ships in column from foremast to foremast is 400 yards.

Out in the night a flotilla of *destroyers* is seeking to attack these battleships. Suddenly a search-light flashes out and holds an object dimly illuminated. The alarm has been given and the eyes of the fleet, over 200 search-lights, are boring their bright shafts of light through the darkness, sweeping fitfully and uncertainly about. Now one and then another dim object is held while the small guns of the battleships are spitting furiously. The flotilla is steaming at 30 knots' speed and at wide enough intervals between the 10 components to allow each boat to fire three torpedoes aimed at the centre of the vast illumination ahead of it. From the head to the tail of the battleship column the available target is 400 yards times one less than the number of battleships plus the length of one ship, or about 5000 yards. Imagine the flotilla is armed with a 6000-yard torpedo, and has been discovered at this distance. In just one minute the flotilla will be 5000 yards away, in two minutes, 4000 yards away. The flotilla commander is waiting the time to arrive when the shots of the enemy will make it imperative for him to fire and withdraw. He must not risk his *destroyers* unnecessarily, for there are many more nights and torpedoes are plentiful and not expensive. A rocket soars heavenward from the *destroyer* of the flotilla commander and at the signal 30 torpedoes have been launched on their errand of chance.

Now let us see what are the mathematical probabilities in favor of those 30 torpedoes as they speed toward the battleships 4500 yards distant.

Each *destroyer* fires three torpedoes, making a total from the 10 boats of 30 torpedoes.

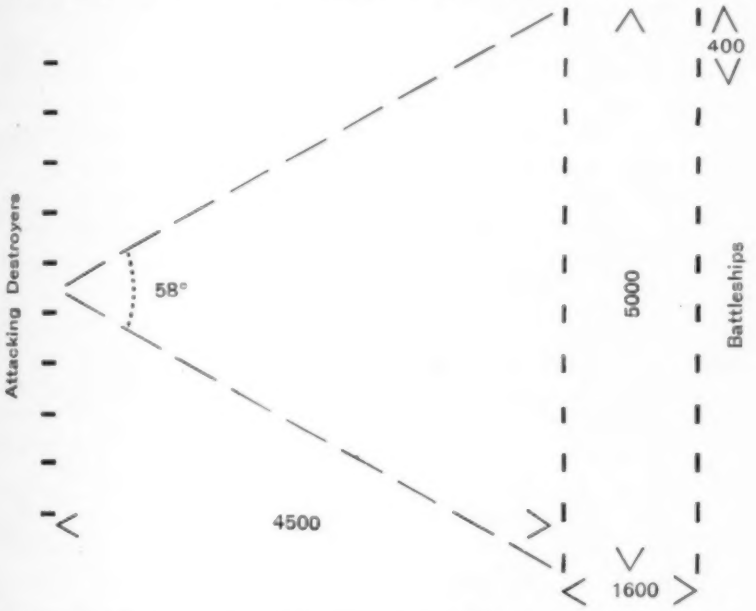
Take the length of a battleship as 500 feet.

Then the battleship target in the first column will be 2000 yards and the spaces between the ships will be 3000 yards.

The angle subtended at the flotilla by this distance, viz., 5000 yards will be 58 degrees if the attack is normal to the column and it is only fair to allow that a torpedo will run accurately within this angle. Then each torpedo fired will have a probability of hitting one of the battleships of the first column repre-

sented by ⅖; that is out of each five shots fired two hits should be made. Then with 30 shots every battleship of the first column will be struck, provided, of course, the hits are properly distributed, which, of course, they will not be Again 12 torpedoes having hit, 18 have passed through the spaces and their chances of hitting the second column will be represented by the figures 7/18, or out of the 18 torpedoes, seven will probably hit; making a total of 19 hits out of a total of 30 shots.

The above has been given merely to show wherein the danger of a weapon considered inaccurate may lie. The *destroyer* need



not creep upon its powerful antagonist until it is so close that the torpedo cannot miss. That kind of attack has gone quite out of fashion. It is now merely a gambling venture and one in which the poor battleship can have no part. The victim must simply sit and look pleasant and after the torpedo has missed give a sigh of relief and say, "never touched me." The *destroyer* really, quite contrary to tradition, need not be in any real danger; at the moment of discovery when the terrifying but really harmless, or nearly so, fire of the battleships is being directed upon it, it can fire its torpedoes and retreat to wait another favorable opportunity later in the night.

No one would contemplate meeting an arm of the enemy's forces with an arm of less range and at distances where the enemy can destroy with safety to itself.

The combination of range and accuracy of the torpedo defense battery, search-lights and conditions of night firing at torpedo craft forces this condition of disadvantage. The only way in which the forces for defense can be utilized is to decrease the range, *i. e., advance the guns and search-lights to a distance such that they can destroy the torpedo-carrying vessels before the torpedo can destroy the battleship—this means destroyers.*

It must be remembered as an axiom, that the enemy will naturally choose for attack the weakest point in our defense. If we are short on battleships, he will probably force a day action. If we are short on *destroyers* and he is proportionally strong, the enemy will avoid a day battle and depend upon his stronger arm to throw the fortunes of war in his favor.

We are only as strong as our weakest arm. Surplus battleships will be of no avail if we are invitingly weak in destroyers.

This article has been made explicit and elementary because the subject lends itself to be handled in that manner. That we are alarmingly weak in *destroyers* can be no secret; the statistics are where everyone may read.

The point is, are *destroyers* vital to the welfare of an offensive battleship fleet? If so, is it not our duty to point this out to those who are empowered to keep the naval arm of the nation strong enough to defend the honor and traditions of the nation?

That *destroyers* are indispensable to the fleet seems axiomatic and the number needed should not be less than those maintained by a possible rival. Four per battleship does not seem excessive when the possible destructive power of the torpedo is considered. This is the figure maintained by the principal navies of the world. We must remember that a *destroyer* cannot be built in a month. In the ordinary course of event two years is the minimum of time to turn out the finished product.

The fleet must be defended at night by its destroyers; that to the writer is the one big question to which the entire service should direct its attention if the navy is to be prepared to render to the country a proper return on the day of battle.

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AN EARLY "GLOBE-CIRCLING" CRUISE.

By EDGAR STANTON MACLAY, A. M.

It is by the process of comparison that concrete objects are shown to be large or small. The artist, in drawing a picture of a building, will insert in his sketch forms of men, horses, wagons or some object the size of which is familiar to the public, so that by comparison the beholder gains some idea of the height of the structure. In the same way achievements in the abstract are shown to be great or little. A journey undertaken two centuries ago was adjudged long or short by comparison with other contemporary travels, and diplomatic triumphs of past days were rated according to other feats in the same line at that time. It is by measuring the great accomplishments of the present day with those of the past that we arrive at a true estimation of the tremendous strides that have been taken in the march of progress in the last few decades.

For these reasons the globe-circling cruise of the United States frigate *Potomac*, 1831-1834, becomes especially interesting when compared with the recent voyage of our great battleship fleet. It is here that the lines of historical perspective are brought out so that even the layman can see at a glance what astounding advances have been made, not only in the science of naval warfare, but in the development of our country and in the marvelous expansion of civilization the world over.

In many important features the cruise of the *Potomac* was identical with that of the great steel fleet. In each we find the highest development of nautical skill as then represented, the latest and most approved specimen of naval architecture and the finest equipment. In each we find our men prepared for "frolic or fight" and while American capacity for the latter, fortunately, had no occasion to display itself in the battleship voyage, it was brought out in the *Potomac's* cruise in a manner that reflected credit on our naval prowess.

The courses taken in these two great voyages were almost identical (in the reverse), the frigate taking the easterly and the fleet the westerly route around the world. Nearly every important port visited by the *Potomac* being entered, three-quarters of a century later, by the battleships. And in a comparison between the receptions given to our two representatives of American naval power in these different ports, we find much that is comparable; while in just those points in which they differ are shown the revolutionary changes that have taken place in the map of the world and in the relative standing of nations.

As our battleship fleet represented the highest development in naval architecture in 1908, so the frigate *Potomac* was regarded as the finest specimen of fighting craft in 1831. That her main battery of long 32-pounders was regarded as "enormous" weight for a frigate in her day, may be inferred from a remark made by Captain Carden of the British frigate *Macedonian* to Captain Decatur of the American frigate *United States* shortly before those ships engaged in battle. Before hostilities broke out between our country and England in 1812, Decatur and Carden exchanged visits aboard their several commands. On a certain occasion, while Carden was dining with Decatur, the former "particularly pointed out the inefficiency of the 24-pounders on the main deck of the *United States* and said that they could not be handled with ease and rapidity in battle, and that long 18-pounders would do as much execution and were as heavy as experience had proved that a frigate ought to carry."

Such was the opinion of an experienced British commander in 1812 and his opinion undoubtedly reflected the collected wisdom of the Admiralty on that point. The result of the action between the *United States* and *Macedonian* demonstrated incontrovertibly that this opinion was erroneous.

But if 24-pounders on the main deck were believed to have been too heavy in 1812, what must 32-pounders have been thought of a decade or so later? Yet we find British naval experts declaring our "new" fleet of 1815-1831 to be the most formidable (taken ship for ship) in the world; and, what is more remarkable, we find the Admiralty following our lead by building frigates on the "exact lines" of American 44-gun craft. In 1820 the British Government sent an officer to inspect our navy, who reported that "the organization of the American Naval Department, either for

administrative duties or for practical work, is the best system extant. Their ships are the best built and their timber is unsurpassed. Their frigates are competent to cope with ships of the line and their ships of the line with three-deckers; and the whole administration of the navy is conducted with comparatively little expense." In 1826 another British naval expert recorded "it is but justice in regard to America to mention that England has benefited by her (America's) example and that the larger classes of frigates now employed in the British service are modeled after those of the United States."

But the most astonishing feature of this "enormous" increase in the weight of armament in our 1815-1831 fleet was that it had been introduced without materially enlarging the ships. Naturally, when we find that the weight of guns is raised from 18 to 32-pounders in the main battery, we expect some increase in the size of the ships themselves. But the ships were, practically, of the same dimensions as when the *Constitution, President* and *United States* were launched at the close of the 18th century, namely: length 175 feet, beam 43.6, hold 14.3 for *Old Ironsides* and her sisters; and for the *Potomac* and most vessels in her class 175 feet length, beam 45, hold 14.4.

That the *Potomac* was the highest type of the ship-builder's art in her day is seen in the report of her commander in her first cruise in the Pacific, when he said, "I have never seen so fine a sea-boat or one so easy on her spars and rigging; works quick and sure." In such high esteem were the sea-going qualities of the *Potomac* held by her officers that we readily can detect and pardon their excuses for being beaten by the speedy *Decatur* in the third cruise of the frigate when they reported, "Was beaten by the *Decatur* under a variety of circumstances, having the advantage only when the wind was very fresh abeam."

In view of the foregoing facts, it seems assured that the *Potomac,* in her world-girdling cruise in 1831-1834, represented the then highest type of naval architecture and the science of sea-fighting—just as our steel fleet did seventy-five years later—so that a comparison between the two voyages is singularly inviting. In the case of the latter, the great achievement is of such recent date and so much has been laid before the profession and public that merest reference to most important details will be sufficient; but in the case of the *Potomac* the interesting incidents of that momentous cruise seem to have become a shadowy memory.

Fortunately there is in the possession of the writer the original private diary of a petty officer (or seaman of good education and refinement) of the *Potomac* who made this 1831-1834 trip around the world, which throws much light on its leading incidents besides giving a graphic description of that midnight attack on Qualla Battoo on the north coast of Sumatra. The diary contains 104 closely-written pages, bound in sheep-skin and parchment, the size of the volume being 8 x 9 inches. Owing to the fact that several front and back leaves have been torn out and lost, there is nothing to indicate the name of the writer. Aside from the loss of these few pages and the mutilation of the covers the diary is in an excellent state of preservation.

In August, 1831, the *Potomac* was riding at anchor in New York harbor, waiting to take aboard Martin Van Buren (afterward President of the United States) as a passenger. Mr. Van Buren had been appointed by President Jackson minister to the court of St. James and the frigate was to carry her distinguished passenger to England; after which she was to proceed to the Pacific as the flagship of John Downes, who was to command our naval forces on that station. The *Potomac* had been built in Washington, 1821, at a cost of $350,000. Her tonnage was 1726 and her complement 480. She was in the same class as the *Brandywine, Columbia, Savannah, Santee, Sabine, Raritan, St. Lawrence, Congress* and *Cumberland*—the last three figuring prominently in the attack made by the Confederate ironclad *Merrimac* on the National vessels in Hampton Roads, March 8 and 9, 1862.

We can readily imagine that the prospect of having such a great man as Mr. Van Buren for a passenger on the trip across the Atlantic, put the officers and men of the *Potomac* on their mettle; while the ship herself, undoubtedly, was set in the best possible order. The hotels of New York were not filled with wives and relatives bidding a sad adieu to loved ones—as were the hotels around the waters of Hampton Roads when the battleship fleet was about to sail—but the deck officer of the *Potomac* witnessed many heart-rending partings.

It was in the midst of these scenes of leisurely preparation for sailing that orders from Washington reached the frigate, changing her itinerary so as to eliminate the voyage to England and to make all haste for Quallo Battoo, on the north coast of Sumatra,

where on February 7, 1831, the natives had made a murderous attack on the American trading-ship *Friendship*, of Salem, Mass., commanded by Mr. Endicott. Captain Downes was directed to visit summary vengeance so as to inspire respect for the American flag in that distant quarter of the globe, so the *Potomac's* people knew from the start that they had "fight" as well as "frolic" in store for them.

It does not appear from this diary on what day the *Potomac* sailed from New York, but from other records it is known to have been on the 27th of August. The first connected entry in the diary reads as follows:

> The light-house gradually receded from our sight and left us to ponder upon future events and to seek out new objects of interest in far-distant climes, to experience the good and ill that attends the life of a mariner and to gain honor or dishonor as the fates might decide. The frank, generous and open heart of a true son of Neptune knows or recks not of the dangers that attend his perilous adventures. He is happy in leaving his country for the reason that he looks forward to the hour when he may return with the fruits of his dear but laborious occupation; to scatter it with an open hand among his friends, and again launch forth upon the treacherous ocean to search out new manners and customs, and learn in foreign lands the good which always attends magnanimity and the evil which inevitably results from acts of tyranny and oppression.

Taking the usual course pursued in those days for the Indian Ocean, the frigate, on the 21st of September, sighted the Cape de Verde Islands and then shaped her course for the coast of Brazil. Three days later the monotony of the passage was relieved by a chase after a supposed pirate, which is picturesquely described in the diary as follows:

> On the morning of the 24th of September we discovered a sail on our weather bow; bore up for and spoke her. She proved to be the whale-ship *Mercury* of New Bedford, 36 days from home and bound for the Pacific ocean. At 3 p. m. another sail was reported on the weather bow, the *Mercury* astern of us. The stranger was down until within about two leagues of us when she suddenly put about and made all sail in an opposite direction. We, for a short time, stood on our course, but the keen eye of our commander discovering the attempt at flight, which every moment became more apparent from the quantity of sail which she spread at intervals and which excited strong suspicion that she was not what she should be, immediately stood for her; and her royal and topgallant sails were, in half an hour, perceptible in the distance.
>
> A brief conversation passed between the commodore and the first lieutenant, and a midshipman was seen wending his way to the forecastle, apparently in search of some important personage. In an instant after, the

shrill pipe was heard blowing with the hoarse voices of the boatswain and his mates in the remotest parts of the ship, and quicker than the untameable lightning (all hands having been called to make sail), every rag of our muslin was floating in the breeze and the next instant extended above the taper yards. The loud notes of the drum and fife called all hands to quarters, and our crew (with the activity of men who knew their duty) sprung to their stations and with impatience waited to execute each command of their superiors.

Orders from the quarter deck were now given to run in and secure the guns and close the ports, fore and aft, which was immediately perfected, thus disguising our vessel to resemble the India Company ships of England, which we thought would bring the stranger down to us, but she was too intent upon her own safety to hazard a second view of our batteries. The retreat was beaten and all hands rushed to the spar deck to watch the movements of the supposed pirate.

At 5 p. m. the chase appeared like a speck on the vast sheet of the ocean, but the lofty and giant strides of our noble ship were fast approaching her, and as the last ray of Sol had sunk to rest, her hull and canvas were in sight.

As darkness closed around us and the wild and stormy swell of the sea (which, since the sun had set, gave strong indications of squally weather) began to gain a greater magnitude, and necessity compelled us to haul in our sails, the stranger took his leave and left us to run out and secure our guns without the pleasure of such an adventure as we had anticipated. At daylight, the morning following, a sail was discovered immediately in our track which, we thought and hoped, was the one of which we were in pursuit. We came up with her at meridian, and, our colors being hoisted, were immediately answered with the English, and in boarding her she was found to be the brig *Brothers* (of Lynnhaven, England), 39 days from Liverpool, bound to Pernambuco.

At this period both America and England maintained a regular naval force off the coast of Africa in a concerted effort to suppress the slave trade. The craft that so anxiously eluded the *Potomac* may have been engaged in this illicit traffic.

About half-past eleven, on the night of October 6, the *Potomac* crossed the line so that the ceremony of shaving was omitted "very much to the satisfaction of the uninitiated and to the great disappointment of our old tars," and after sighting Cape Frio on the afternoon of the 15th the frigate put into the beautiful harbor of Rio de Janeiro on the following day.

There was no suspension of business when this American "naval force" entered Rio in 1831. In fact, the arrival of the *Potomac* occasioned little or no special interest so far as can be detected in this diary. As compared with the great battleship fleet, Downes' ship was insignificant indeed. Formidable as her

broadside of 32-pounders undoubtedly was at that time, it becomes insignificant as compared with the enormously greater capacity for offense and defense of the sixteen massive battleships which visited the same port three-quarters of a century later. One 6-inch modern rifle would have been more than a match for this "formidable" wooden ship. The only "booming of guns" noted in the diary is under the date of November 1, when "the United States sloop-of-war *Warren*, commanded by Captain Cooper, hove in sight off the harbor and at 6 p. m. came to anchor astern of us. As she brought to, the thunders of her cannon rolled along the smooth waters of the bay and as the last sound died away" in the distance the frigate returned the salute.

A missing leaf in the diary conceals the date of the *Potomac's* departure from Rio, but it must have been on November 3 or 4 that she began her stretch for the Cape of Good Hope. Apparently the stay at the Brazilian port had not been very interesting, for aside from describing some public buildings the writer of the diary had little to record aside from the scenes in the prison. He wrote:

> The City Prison, where criminals of every age, from the beardless boy just entering the summer of life, to the gray head of old age sinking under a burden of afflictions and shame, crowded together in this receptacle of vice and wretchedness, is abhorrent. An evil equally abhorrent presents itself in a walk through the city, and more particularly in the "public square" (which is the great thoroughfare of the place) where may be seen daily hundreds of unfortunate blacks, half naked, straining every nerve under the burdens which they are compelled to carry and marking the causeway at every step with the blood from their manacled and lacerated ankles. Slavery is carried to the extreme point of perfection in this country, and the unfortunate objects of a trade, which in civilized countries should not be known, are treated with a cruelty that should put most inhuman monsters to the blush.

Not long after the *Potomac* sailed from New York a "Company of Dramatists" was organized by some members of her crew, and as they afterward had the honor of acting before the king and queen of the Sandwich Island, some note of their "first appearance" is necessary. This seems to have occurred on the evening of November 22, when the frigate was well started on her lonely run from Rio to Cape Town. On this evening the diary records:

> Our company of dramatists displayed their prowess in the scenic art. The laughable farce in two acts, called "St. Patrick's Day," was performed, previous to which a prologue, written by one of the company, was spoken.

The whole concluded with an olio consisting of songs, duets and recitations. The play with several of the songs excited much mirth, and the entertainments of the evening received the praises they merited.

A description of the life aboard this frigate on her "world-girdling" cruise is given in the diary: On Sunday

None but the most necessary duty is required of the crew. If the weather is fair, divine service is performed and the crew mustered. The first Sunday of each month is allotted to a reading of the Articles of War which contain all the necessary commands and orders that are requisite to the conduct of officers and crew in time of peace and war. At 8 a. m. on muster days the word is passed, "All hands stand for muster, ahoy!" and at 10 the pipe of the boatswain, accompanied with the cry, "All hands to muster, ahoy!" summons every person to the church, where the chaplain, with the capstan for a pulpit, reads the prayers of the church, and concludes the service with a sermon short but impressive. While thus engaged, not a whisper is heard, but all listen with an attention that would do justice to the characters of those who have a more exalted opinion of their moral life; and contemn the idea that sailors can listen to and feel the effects of such addresses.

The dress of the crew in warm weather consists of frocks or shirts (the collars and wristbands of which are lined with blue nankin and set off with fanciful tape work) with trousers of the same material, white as the unsullied snow, neat morocco pumps and shining tarpaulins. In cold weather blue cloth jackets and trousers, white frocks and neat shoes, hats and black silk kerchiefs constitute the uniform. Great pains are taken to keep their clothes clean and in good order, and that no excuse may be had for uncleanliness, two mornings in each week are allowed them to wash, and the afternoon of each Saturday to mend, their clothes. After muster the boatswain, by order of the officer of the deck, technically speaking, "pipes down," or in other words, "men, go do as you please." Those who have the watch remain on deck until 12 o'clock, at which hour the crew are piped to dinner and the watch relieved; the drum is then rolled, calling all those who love the inspiriting nectar to the gun deck where many a smiling face may be seen in the vicinity of the tub which contains their greatest favorite but most inveterate foe. One hour is allowed the men at each meal, at the expiration of which time all hands are called, and the decks cleared and swept down. After dinner the crew are at liberty for the remainder of the day.

In a walk around the decks you may see groups of these fearnaughts lying here and there between the guns, some reading, others playing at draughts, some smoking and pleating sennit for hats, others stretched out under the half deck enjoying the sweet sensation arising from a touch of the wand of Morpheus; each having his own particular manner of killing time, until 4 o'clock, when the pipe and drum again calls them to their meals and grog. At half-past five p. m. the crew are inspected at quarters, and at six the hammocks of the watch that has eight hours below are piped down, after having swung which they return to their duty until 8 o'clock

when the relief is called, and the relieved retire to their hammocks and to sleep until midnight when they are called to duty again until 4 a. m. and relieved as before. Thus passeth the Sabbath, and, with very little deviation, each day of the week. On Thursdays the crew are ordered to dress in their second best, and at 9 a. m. muster at quarters and go through the exercise of the great guns and small arms as though in actual combat. The sailors call this "Rope-yarn Sunday."

The *Potomac* arrived at Cape Town on December 6, after a run of 32 days from Rio de Janeiro. Our chronicler, after noting the "usual salute" between the frigate and one of the forts on shore, said that this frigate and the sloop-of-war *Vincennes*, Captain William Compton Bolton Finch (which touched at this port in 1830), were the only American war vessels that had, down to that time, visited Cape Town. The arrival of the *Potomac* seems to have aroused wide-spread interest for the diary records:

Our frigate was an object of much interest to the inhabitants of the town and the interior country; some of whom, on learning of our arrival, journeyed many miles to have a view of her. . . . . Our decks were daily crowded with the young, the gay and the beautiful, and the visit, although brief, was one of pleasure to all.

In these days of steel construction, steam, chemical and electrical machinery, much of the romance of the sea is lost, so that the memory of "those grand old sail-ship days" should be sacredly preserved. For this reason the beautiful description of "scenery" on the Indian Ocean, as given in this diary, is valuable. The *Potomac* left the hospitable folk of Cape Town December 13, 1831, and the diary records:

After doubling the Cape of Good Hope on the night of December 17, we stretched far into the Indian ocean; the soft and gentle breezes of summer in this hemisphere expanding our canvas and hastening us onward to our distant port. The sun arose in all his magnificence on the morning of the 18th, tinting the eastern skies with streams of molten gold and spreading his effulgence on all around. The sky presented an unclouded expanse, and the gentle breeze of morning fanned the glittering surface of the sea which, like the undulating tide of some beautiful river, bore our proud vessel gently on its bossom. The weather continued pleasant throughout the day and was succeeded by a beautiful moonlight night. But ere "the iron-tongue of midnight had tolled twelve," all hands were aroused from their slumbers by the shrill pipe of our boatswain and the hoarse voices of his mates which, amid the terrific roaring of the gale and deep-toned thunder rolling along the heaven, the war of elements each contending for a superiority in the tumult which raged above and around us, seemed the dread precedent of some awful calamity.

"Reef topsails, reef!" is now the cry. Each man, at the well-known signal, sprang from his hammock and sought his station on deck or in the tops. The hoarse voices of the junior officers were faintly heard amid the din, but the brazen-tongued trumpet, wielded by our first lieutenant [Irvine Shubrick], was distinctly heard above the fierce roaring of the wind and waves, and, at the word, the sails were gathered in festoons to the yards, as quick as thought, and the next instant the ears of the expectant tars caught the sound: "Aloft, topmen," when they sprang, like the nimble squirrel, to the yards, and as they stretched themselves out upon the spars, gathered the bellying sail beneath their breasts and waited with impatience the words "Reef away." In less time than I have taken to describe the scene, the work was accomplished, and the seamen descended to the deck to sheet home and hoist away the sails, which was the work of but an instant. We sailed swiftly before the wind under double-reefed topsails and mainsail, our vessel contending proudly with the giant waves that rolled around us with their snow-capped tops.

The next day our decks presented a scene of confusion not to be described. The sea broke over us in every direction, deluging our main and spar decks, fore and aft, at every roll, in which the guns on our spar deck several times tasted the wave. We did not see anything of the *Flying Dutchman* during the storm, a circumstance which we did not by any means regret, as we had occasion for every inch of sea-room, and a meeting with that desperate sailer might have proved at the time rather unpleasant. It is said, nevertheless, that he continues to haunt the seas in the neighborhood of the Cape, always close-hauled to the wind and under a heavy press of sail.

It was not until the morning of the 21st that the storm began to abate.

Sighting the islands of St. Paul and Amsterdam, a little more than half way from Cape Town to Australia, the *Potomac* again began to get in the course (in reverse order) taken by the battleship fleet three quarters of a century later. On the night of January 19, 1832, while still in the Indian Ocean, our chronicler gives a graphic description of a meeting with a huge Indiaman, the *Cambrian*, from Batavia, bound for England. He notes:

As we neared each other, previous to speaking, the silver crest of the Queen of Night was seen glittering in the dark expanse above as, amid the lights and shades, the stranger with her lofty spars towering to the skies and enrobed in white, stood like a phantom on the dark blue wave. Dark objects could be seen moving to and fro upon her decks, and the lights which streamed from her ports gave her the appearance of a lofty battleship.

Five days after this, or on January 24, an incident occurred aboard the *Potomac* which served as a welcomed relief to the monotony of the voyage. It seems that on this day two of the

colored members of the crew got into a fight on the berth deck. The diary records:

> The master-at-arms, who is commander-in-chief of this deck, after enjoying the scene for some time with much seeming delight, escorted the blacks to Lieutenant Shubrick who, with his usual good humor, instead of employing a boatswain's mate to operate on the skins of the offenders, gave each a whip which they used upon each other for some time with considerable fierceness and dexterity. Their visages during the conflict underwent various changes, and neither could shame the other in grimaces that would have puzzled the pencil of the most experienced painter to imitate. The largest of the party concerned, who was a tall, gaunt, open-countenanced fellow, was compelled to give in after in vain using every exertion to gain the advantage of his opponent. They were dismissed after being admonished by Lieutenant Shubrick that something similar would happen the next time they attempted to disturb the repose of our worthy brethren of the berth deck.

As the *Potomac* was now nearing the scene of the fight that was to take place, Captain Downes "on the afternoon of January 25 inspected the force destined for the attack on Qualla Battoo. The different divisions were formed and went through their evolutions better than could have been expected from men who detest the very name of soldier or marine and have so great an antipathy to that part of a ship's company that they are ever ready to dub them with the most opprobrious epithets. But at this period such feelings were buried and they joined with the guard with one voice and determination to revenge the death of their countrymen. They knew their duty and were determined at all hazards to perfect the mission on which they had been ordered."

It was on January 28 that the frigate sighted Hog Island, which lies off the coast of Sumatra just southeast of Qualla Battoo, but, owing to unfavorable winds, anchor was not dropped off Qualla Battoo until February 5. This interim had been employed by the Americans in disguising their ship so as to conceal her identity from the natives. Her guns were run in, the ports closed and the sails were rigged in a slovenly manner so as to give her the appearance of a merchantman.

As this diary contains, probably, the only full and connected account of an eye-witness of the spirited attack that followed, it is given verbatim as a valuable historical record:

> Our passage from the Cape of Good Hope to this place employed 55 days. As we neared the coast the Danish flag was hoisted, and on coming to anchor our sails were furled in true merchant style, four men only being

allowed to go aloft from each top to perform this duty. Every precaution was taken to avoid a discovery of our real character and (as the sequel will show) we were successful—the natives were deceived, and our attack on them the following morning was a complete surprise.

At half-past two p. m. the whale-boat, containing our first lieutenant, Mr. Shubrick, Lieutenant Edson of marines, and Lieutenants Pinkham, Hoff and Ingersoll with Acting Sailing Master Benjamin I. Totten and Passed Midshipman H. Tooley, left the ship for the shore to reconnoiter the forts at Qualla Battoo preparatory to an attack on that place. The first-named person represented the captain, the second the super-cargo, and the residue were dressed in sailor costume to represent the boat crew of an Indiaman. After the departure of our boat, a small sail was descried standing for the ship; at 4 o'clock she came alongside loaded with fish. The crew consisted of four Malays, natives of Pulo Kio. They were secured immediately on coming alongside and remained on board until the following morning when they received a price for their cargo much beyond their expectations and left the ship much delighted with the munificence shown to them and without a murmur at the durance in which they had been held.

At half-past four our boat returned, not having landed on account of the warlike appearance of the natives collected on the beach. At 8 p. m. our boats were hoisted out and every preparation made to leave the ship at midnight. Those destined for the attack were then at liberty to employ their time as they thought proper until the appointed hour. All sought repose upon the decks with their weapons for a pillow, save those who were to remain to guard the ship. These were divided into watches which relieved each other at intervals of two hours. Soon after we left Rio de Janeiro our crew were mustered and 260 men were chosen to avenge the death of our countrymen. I had the honor to be one of the chosen few. We were regularly drilled every day by divisions, and by the time of our arrival at Sumatra, had acquired the knowledge of our exercise to perfection.

'Twas midnight when all hands were aroused from their slumbers and our decks in a few moments swarmed with the host destined for the attack; all busily employed arming themselves with the implements of death, their bosoms bared to whatever might ensue, the storm, the tempest or the deadly turmoil, and heaving with delight at the martial sounds that broke the stillness of the hour. The bright star of morning had just begun to appear beneath a dense mass of dark clouds resting on the sea when our boats, which had been early prepared, left the ship, bearing many a true and gallant heart who were, ere the sun had attained his meridian splendor, to gain a proud name in the annals of our country. The most perfect silence reigned around, broken only at intervals by the faint dashing of the oars or the whispered commands of our leaders, which were drowned as they reached the habitations of the foe by the roar of the surf rushing impetuously to the sea-beat strand.

The morning star had shone brightly in the heavens for two short hours when our hardy few, led on by a bold and daring spirit with many a proud

and aspiring bosom in his train, neared the shore, the immediate vicinity of which was known by the terrific roaring of the wild waves as they dashed in mountain billows before, behind and around us. As the day began to break we landed upon the soil of our enemy and formed in silence and good order, each division according to its number, and a 6-pounder bringing up the rear. The fusileers, a company of fine, stout and daring fellows, distributing themselves on each side of our line.

As we neared the lower fort the second division of musketeers and pikemen, under the command of Lieutenant Hoff and three midshipmen, filed off to the left, and were soon lost amid the thick foliage which grows in wild luxuriance on every part of the island. In a few minutes after their departure the din of an hundred firearms was heard and assured us that the work of destruction and death had begun, and we hastened to join battle with the remaining foe.

The marine guard, under the command of Lieutenants Edson and Tenett (with the first division of musketeers and pikemen under Lieutenant Ingersoll) engaged the center fort, and after a short but desperate and bloody conflict in which one of the guard was killed, one dangerously wounded and several slightly wounded, it was taken, and all who had the semblance of a native, slaughtered.

The third division under the command of Lieutenant Pinkham (to which I was attached), the fusileers under the command of Lieutenant Shubrick, and the Betsy Bakers (so designated from the name of the little gun which they had christened "Betsy Baker"), led on by Acting Sailing Master Totten, were left to charge the third and most formidable fort—our whole force amounting to 85 men. When we came within a few yards of the fort under a brisk fire of musketry and swivels from the enemy's batteries, we poured in a volley of leaden death which made the foe start from their fancied security and shook the high arch of heaven with its thunders. We then charged the enemy in the rear, leaving the 6-pounder and fusileers to keep them employed on the opposite side, until we could make a breach sufficient to carry the fort with our division, making terrible slaughter in the host that had the hardihood to oppose us. At a signal from the commander, the gun [Betsy Baker] proceeded to the bank of a creek, in the rear (under a brisk but impotent fire from the enemy's batteries, their guns being so disposed that to turn them was impossible) where they commenced a quick but steady cannonading upon the large proas or schooners in the creek; sweeping their decks fore and aft and killing great numbers of the renegades and doing considerable injury to their vessels—the largest of which they succeeded in getting under way, and escaped by rounding the point of an island in the creek off which they had anchored.

In our second charge at the rear of the fort, one of our men was shot through the brain and immediately expired, and three others were slightly wounded, but we sprang with renewed vigor to the charge of death and revenged our fallen shipmates nobly, heaping the heathen piles upon pile at every discharge and staining the green sward with the blood of the victims of our ungovernable fury. The massive gate which led to the en-

closure around the fort was then torn from its base, and the gun planted so as to insure success in the attempt to gain the possession of the fort. But the flaming habitations of the fort which were throwing dark columns of fire to the sky and the almost furnace heat by which the gun crew were surrounded, forced them to evacuate, when the gun was instantly seized by a third of her stout crew and carried to the upper side of the fort where they kept up a steady discharge of canister and grape shot for forty minutes, during which time the foe within the battlements fought most desperately. Our object was to compel the enemy to evacuate their stronghold and every stand of grape and canister had been expended without effecting this purpose.

Recourse was now had to the boats, from which was obtained ten bags containing forty musket balls each; in three successive discharges of which we succeeded in dislodging them, but from the heaviness of each charge our gun was thrice dismounted and the carriage shivered to atoms which rendered her unfit for further service. But our aim had been accomplished and as the redskins attempted to escape, several of them were shot down by the fusileers with an aim that would have done honor to Morgan's inimitables.

At this instant the center fort blew up with a tremendous explosion and sent the helpless foe within its battlements to notify the shades of the coming of their kindred. The red glow of an hundred habitations shone in the morning sun, and the grand flag of our country was, in the space of two hours, waving in triumph o'er the ramparts of the conquered and the slain.

Thus fell before the brave seamen and marines of the *Potomac* the strong fortress of these heathen pirates which had, in the knowledge of the oldest inhabitants of the island, withstood the combined efforts of different tribes for an hundred years—presenting a striking example of the power of American arms, the bravery of Columbia's sons and the justice of their cause.

The shrill notes of the soul-stirring bugle, with the roar of the surf, which was every moment gaining greater impetus, warned us that the hour of departure from these scenes of blood and carnage was at hand. Our gallant band was soon collected on the beach and we hastened on our return to the ship when, on our arrival, we were warmly greeted with the cheers of those who had been left to protect her, which, with the grateful smiles of our commander and the friendly interrogations of those who had witnessed our daring at a distance, amply repaid us for our toil in the recent *melée* and assured us that our actions were commended. The bodies of our deceased shipmates had been conveyed on board ship sometime previous to our departure from the shore, and on our arrival received a sailor's burial. They who, but a few hours before, had rushed in all the strength of manhood in the thickest of the fight, now lay enshrined beneath the dark blue waves and, though no sculptured marble marks the place of their sepulture and no fair flowers bloom upon their graves, yet a monument of their devotion to a just and glorious cause will rest in the hearts of their countrymen.

On the following morning (February 7) we got under way and stood

within a mile of the shore when we anchored, and at meridian commenced and kept up a steady cannonading upon the town and forts until a quarter past one p. m. About 6 o'clock in the evening a boat was discovered leaving the shore at Qualla Battoo, which came alongside of us at 7 p. m., containing three natives bearing a flag of truce. They came on board and were conducted to the presence of Commodore Downes. When they had advanced within a short distance of him, they bowed with the utmost submission. They bore a message from the principal chiefs begging a cessation of hostilities and representing their situation as truly deplorable. During their stay on board, which was until 8 p. m., the good cheer of our officers was proffered to and accepted of by them, until the potent nectar of which they had tasted profusely began to operate—when they left us, bearing an answer from the Commodore to their chiefs, urging them to visit the ship that a negotiation might be had, and threatening them with vengeance more potent than they had so lately witnessed if they did not restore the spoils taken from the *Friendship*.

INCIDENTS ATTENDING THE BATTLE.

About an hour after our departure from the ship (on the eventful morning of the 6th) and when within about two miles of the shore, a meteor of the most brilliant and splendid rays shot across the heavens immediately above us, lighting the broad expanse with its beams from west to east. We hailed it as an ernest of victory and the bright augury of future fame.

The Rajah Maley Mohammed was killed at the first fort attacked by our men after fighting for some time like a lion; and after his fall the marks of three musket balls and three bayonet wounds were discovered on his chest. A female, who from the richness of her dress was supposed to be his wife, (after he had fallen) seized the saber which he had been wielding with so much ferocity, and commenced the work of destruction by wounding one of our seamen in the head and almost severing the thumb from his left hand; after which, from the wound she had previously received, she fell on the hard pavement of the fortress and died.

When our firing had become general the natives could be seen fleeing in every direction from the town and forts; some carrying such articles as they esteemed most valuable, and others making the best use of their neat heels to carry them beyond the reach of our musketry.

Those with whom we were at war were brave, and fought with a fierceness bordering on desperation. They would not yield while a drop of their savage blood warmed their bosoms or they had strength to wield a weapon —fighting with that undaunted firmness which is characteristic of bold and determined spirits and displaying such an utter carelessness of life as would have been honored in a better cause. Instances of the bravery of these people were numerous, so much so that were I to give you a detail of each event, my description would, perhaps, become tiresome and insipid.

Our ship was visited on the morning of the 8th by Po Adam, the rajah of Pulo Kio (the noble and disinterested native, it will be remembered, who saved the lives of Captain Endicott, the second mate, John Barry, and part of the crew of the ship *Friendship*) who informed the Commodore

that the number of the enemy killed (on the 6th) exceeded one hundred, among whom were forty of their best warriors, and the wounded and missing amounted to double that number. Mr. Barry came out with us from the United States as second sailing master of the *Potomac*. He acted as our guide during the battle and took a very distinguished part in the extirpation of the assassins.

When Po Adam ascended the side of our ship, Mr. Barry stood back to see if he would recognize him, which he did immediately, and, running to him, embraced him with the warmth of a brother. He examined the ship in every part, accompanied by Mr. Barry, and appeared particularly delighted with the sight of our great guns whose thunders had shaken the island a few hours previous. We were gratified to learn that the proa which had succeeded in making her escape on the morning of the attack, had been taken the same morning by Adam who, with a small party, was lying in ambush on the margin of the creek watching the success of our arms. When she came opposite his place of concealment he, with the aid of his followers, took her, killed five of the enemy and put the remainder to flight. They escaped to the mountains. It proved to be the same proa which had been wrested from him the day on which the outrage upon the *Friendship* was committed—which happened precisely one year previous to the day on which we visited them with such terrible retribution.

During the day a large number of friendly Malays from Soo Soo and Pulo Kio visited the ship, bringing off with them fruit, vegetables and poultry in great abundance. The Soo Sooans appeared to be more civilized than any other of the neighboring tribes. Some of them spoke very good English, and almost all had a smattering of the language sufficient to make them understood.

A brig, which we had discovered in the morning standing along the coast, ran up to our anchoring ground at 8 p. m. and came to about 200 yards from us. We were visited again on the morning following (February 9) by two of the petty chiefs from Qualla Battoo, under a flag of truce, bringing with them poultry, eggs, shells, vegetables, etc. They remained on board but a short time and left the ship without having made a sale, the crew reserving their gains for the more friendly natives of Soo Soo and Pulo Kio. The captain of the brig, which arrived the evening previous, boarded us this morning and reported the *Olive* (Marshall, master) 113 days from Boston, bringing letters and papers for Commodore Downes and others.

The *Potomac* had been 166 days from home and this was the first news she had received from America since sailing. In the case of the battleship cruise around the world, news from home awaited the fleet at each stopping place, even before the arrival of the ships. The *Potomac's* people were unable to send answers to these letters until March 13, more than four weeks later, when they met the American ship *Philip I*, from Batavia, bound for Philadelphia.

By February 15 the *Potomac* had replenished her stock of wood, fresh provisions and water, and was ready to resume her voyage. On this day

> many hundreds of the natives who had not yet visited the ship came off from the shore, and from daylight until sundown our decks were crowded with these monuments of treachery and barbarity. At half-past seven o'clock the last straggler gained his skiff and stood across the waves to his own mountain home; and, heartily tired of their presence, each inmate of our gallant ship sought his berth, and sunk into sleep, amid the low murmuring of the sea and the soft wailing of the summer breezes.

Our chronicler gives the following description of these natives as they appeared to him:

> The Malays resemble the Indians of North America in some particulars. They are generally of medium size, inevitably erect and slender-built, but remarkably strong and active. Their step is handsome and firm, and their dark rolling eyes speak them of a fierce and savage nature. They have immeasurable mouths, and the great quantity of beetle nut chewed by them, and which colors their mouths to a dark crimson, gives them a disgusting and horrible appearance. Their costume consists of a turban of silk or linen, fancifully embroidered with silver or gold tinsel, a sash thrown in careless folds around their person, partially covers their bodies, and the lower extremities are hidden as far as the knees by an article of apparel which, I believe, is anonymous. The chiefs wear a profusion of gold about them, apparently of much value, and around their waists a belt containing the creese or poisoned dagger and a box, generally of gold or silver roughly wrought, in which they carry the beetle nut; and another box (brass) containing a white paste called cheenam. Sundry heavy rings grace their long fingers, and their wrists and ankles are encircled with massive rings of gold.
>
> Their characters as pirates need no superfluous proof. Instances of their marauding on the sea-coast are numerous, and in proas containing 60 or 70 men they have been known to attack and make prizes of heavily armed ships, murder the crews, and, after despoiling them of every article of value, leave them to the mercy of the wind and waves. A Dutch frigate was, some years ago, attacked by them at Muckie, a pepper port lying a few miles southward of Qualla Battoo, and after a desperate fight, in which numbers on both sides were killed, the natives were compelled to flee to the mountains.

The *Potomac* sailed from Qualla Battoo early on the morning of February 18, 1832, and from this time on her cruise was largely identical (in the reverse) with that of the steel fleet seventy-five years later. On the fourth day out, February 22, Captain Downes perpetrated one of his little jokes on the crew. It was the hundredth anniversary of the birth of George Washington and word had been passed that an "extra-extra" allowance of grog would

be served as a benefiting recognition of the centenary. After the salute of seventeen guns had been fired at noon, Downes mustered the crew and after solemnly admonishing the men "not to drink a quantity sufficient to intoxicate," announced that an *extra* quantity of *water* would be served with the *usual* allowance of grog, "which occasioned much grumbling among our 'old salts' and was received with little less disgust by the younger part of the crew—all of whom expected a real substantial tuck out of the pure ardents."

Clearing the Straits of Sunda, the frigate, on the 6th of March, wooded and watered at Bantam and on the 19th anchored off Batavia, where she remained until April 8. During her stay at this port the sick list increased from 12 to 59 and several of the men died, among them being Nathaniel K. G. Oliver, of Boston, private secretary to Commodore Downes.

Sailing from Batavia on April 8, 1832, the *Potomac* passed through Gaspar Straits and soon after entering the light blue waters of the China Sea, experienced the first really cordial greeting that in any way resembled the ovations given to our steel fleet three-quarters of a century later. The incident is recorded:

> About 11.30 a. m. of the —— (date omitted) we spoke an English bark, 35 days from Calcutta, bound to Canton. On coming within speaking distance, her skysail was lowered as a matter of compliment and, as she dropped astern of our frigate, her crew cheered us in handsome style. We were unprepared for such an event, but who better than American seamen know how to reciprocate the most friendly feelings. Our men, by order, immediately sprang to the rigging and gave three hearty rounds in return, which were answered by two from the bark. It was a compliment little expected and wholly unlooked for, but we acknowledged the good feeling of the Briton in our best style. As we braced up on our course, our band struck up "God Save the King," and the red cross of England descended to the deck of the bark as the last note was lost in the mellow murmuring of the sea.

Remaining at Macao, where she arrived June 5, only a day, the *Potomac* hastened on her voyage across the Pacific, and on July 23 anchored off Honolulu in the Sandwich Islands. It was in this port that the crew of the frigate got their first leave to go ashore since sailing from New York *almost a year before*. The incident is described in the diary:

> Early on the succeeding morning, July 24, both watches were called, the decks put in complete order; the brass work underwent a more than ordinary burnishing; the rigging was stopped into the sides or laid in neat

flemish coils upon the snow-white decks, and each of the crew took more time than he was wont to prepare his clean frock and mustering trousers for a "cruise" on shore, as it had been rumored that we were all to have 24 hours' liberty. On the day following, at 2 p. m., we saluted the town with 17 guns, which was returned with 20. After which the American and English consuls visited the ship.

On the morning of the 25th the hopes of the crew were realized. All the first part of the starboard watch were called to muster in the weather gangway and had their names committed to paper. This preliminary over, one and all made a simultaneous rush to the cockpit in such confusion that some were fairly carried to the desired haven on the shoulders of their fellows; from whence they, in a short time, emerged with swelling bosoms and hands grasping small parcels which, in the hurry, had been thrown together in "elegant irregularity." Suffice it to say, they went on shore, disposed of their bundles at half cost, got most gloriously intoxicated, fought, acted the tar, returned on board with most awfully scarred features, got partially sober, and returned to their duty—much the worse for the "cruise" in pocket, appearance and feelings.

There were yet three quarter watches in waiting to experience the many ills attending a "cruise on shore." They also went in time and, taking the conduct of the first class as a precedent, returned little better satisfied as to the pleasure they had seen and with a much greater majority of painted eyes and bruised limbs. Some who had drank too deeply of the inebriating bowl, after its power had died in the system, were seized with (that most horrible of all disorders attendant upon drunkenness) the "*mania a potu*," and in this state of frenzy lingered for several days.

It was at Honolulu that this globe-circling American naval force received its first royal recognition. "On the 5th of August," says the diary, "the ship was visited by the king and queen of the Sandwich Islands and their suites. On their arrival and departure from the ship, a salute of 21 guns was fired. . . . . At 5 p. m. His Majesty and suite left the ship amid the roar of cannon."

Five days after this the *Potomac's* dramatists "performed in the king's palace before a large and highly interested audience of American and English ladies and gentlemen and a numerous assembly of natives. The tragedy of 'Douglas,' with the farce of 'Fortune's Frolic' and an olio, consisting of songs, duets and recitations, passed off with great applause. The *dramatis personae* were allowed 24 hours liberty after the performance and their bacchanalian scenes, some of which were witnessed by the officers, formed a subject of amusement for many days."

The *Potomac* left Honolulu August 16, 1832, but several pages missing from the diary somewhat obscure her course. The next connected entry is: "We arrived at Valparaiso October 23, after

a passage of 34 days from Otaheite and having run, per log, the distance of 37,674 miles since our departure from the United States." It was here that the frigate fired a salute of 21 guns "in honor of the town, which was handsomely returned with an equal number" by the fort. The *Potomac* also was honored by a visit from the "Governor of Valparaiso, the admiral of the port and the American and English consuls."

Captain Downes was now fairly on the scene of the memorable cruise of the 32-gun frigate *Essex* in 1813-1814, Downes serving in that ship as first lieutenant. It was at Valparaiso that the *Essex* made her gallant defense against the British warships *Phoebe* and *Cherub*. Downes took advantage of his stay in these waters to visit the various places at which the *Essex* touched in her romantic cruise two decades before.

Sailing from Valparaiso on December 3, 1832, the *Potomac*, after a run of thirteen days, anchored in the harbor of Callao, by which time she had fallen in with United States cruisers *Dolphin* and *Falmouth*, Captain Gregory, of the Pacific squadron. While at Callao, January 25, 1833, our frigate was visited by "the President of Peru and lady." Leaving Callao on February 28, the *Potomac* returned to Valparaiso (after recording a total run of 41,043 miles for the cruise so far) on March 15, where she remained until May 22, when she sailed for Coquimbo, reaching that port on the 27th. During the summer Captain Downes paid a visit to the Galipagos Islands, where the *Essex* and her prizes had concealed themselves from pursuing British warships in 1813-1814.

At this point the diary closes. It is known that the *Potomac* returned to the United States via Straits of Magellan, probably touching at some of the South American and West Indian ports, and arrived in Boston May 23, 1834, thus making a complete circuit of the world in her cruise of two years and nine months, in which time she had logged more than 60,000 miles. Subsequently she was commanded by Captains J. J. Nicholson, L. Kearney, G. W. Storer, T. M. Newell, J. Gwin and J. H. Aulick, successively. From October 20, 1834, to March 5, 1837, she was flagship for Commodore D. T. Paterson in the Mediterranean and for Commodores C. G. Ridgely, Charles Morris, D. Conner and M. C. Perry successively on the Brazil and West India stations from 1837 to 1847. In 1858 the frigate was broken up.

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A NEW METHOD FOR DETERMINING THE FINAL DIAMETER OF A SHIP.

By NAVAL CONSTRUCTOR D. W. TAYLOR, U. S. Navy.

The determination of accurate results when making turning trials is difficult; at least it appears to be difficult to obtain identical results from sister ships or from the same ship when tried twice under apparently identical conditions. It is commonly assumed that after beginning to turn, the track of a ship for the first 180° begins as a spiral and becomes a circle, and that if no change of helm angle or engine conditions is made, the track is circular by the time 180° have been traversed, the diameter of this circular track being called the final diameter and being, of course, somewhat smaller than the tactical diameter corresponding to the first 180° of turn.

There is a very simple method of determining the final diameter of a ship when turning in a true circle, requiring no observations of a distant object or other observations of heading, and with all observations made from the ship herself. The underlying assumptions are two in number, as follows:

1. That a floating pole or buoy about which the ship turns, remains in the same place while the ship turns.

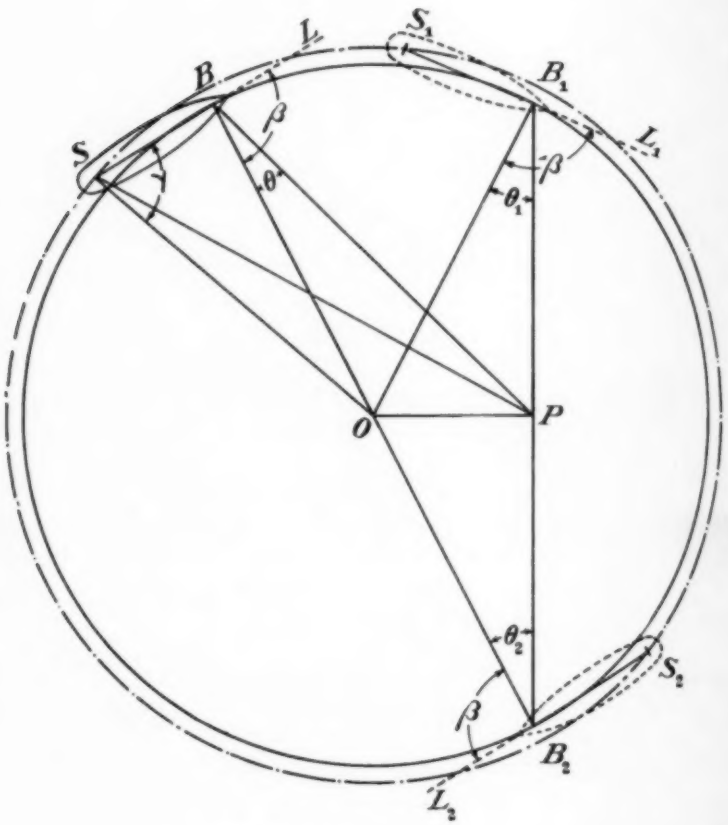
2. That the ship after a time does settle down to turn in a true circle.

Referring to Fig. 1, let *BS* denote the ship turning in a circle whose center is *O*. Let *P* denote a floating pole somewhere within the circle. Let the observer at *B* have a plane table, pelorus, or sextant with which he can observe continuously the angle *PBS*, or *PBL*, and similarly let the observer at *C* be fitted to observe the angle *PSB*.

B and *S* must be in known positions, so that the length of *BS* and its position on the ship are known. It is convenient but not

necessary to have B and S both on the center line. Extend SB to L. Let $OBL=\beta$, $OSL=\gamma$. Since O is the center of the circle being described by the ship the angles β and γ remain constant as long as the ship continues to move in a circle about O, and if we can determine β and γ we can complete the triangle BSO and determine the final diameter of any point of the ship.

FIG. 1.



Let BB_1B_2 be the circle described by B. Join OP and draw B_1PB_2 perpendicular to OP.

Let us call PBL, or the angle measured at the bow station, the bow angle and PSL, or the angle measured at the stern station, the stern angle. We will first consider the bow station. Evi-

dently, $PBL = OBL - PBO = \beta - \theta$ where $\theta = PBO$. Now from the triangle OBP we have $\sin\theta = \frac{OP}{OB}\sin OPB$. During turning in a circle OB and OP remain unchanged, so that $\sin\theta$ varies as $\sin OPB$. Now the maximum value of $\sin OPB$ is unity when $OPB = 90°$; hence $\sin\theta$ is a maximum when OPB is a right angle. This occurs twice during each complete circle, namely, when B is at B_1 and B_2.

Now when B is at B_1 the bow angle $PB_1L_1 = \beta - \theta_1$ has a minimum value, since θ_1 is a maximum value of θ, and β is constant.

In the position B_2 the bow angle $PB_2L_2 = \beta + \theta_2$ has a maximum value since θ_2 is again a maximum value of θ and now is added to the constant angle β. Then we have

$$PB_1L_1 = \beta - \theta_1,\ PB_2L_2 = \beta + \theta_2, \text{ and evidently } \theta_1 = \theta_2.$$

Whence adding $2\beta = (PB_1L_1 + PB_2L_2)$,

$$\beta = \tfrac{1}{2}(PB_1L_1 + PB_2L_2),$$

$$= \tfrac{1}{2}(\text{maximum value of bow angle} + \text{minimum value of bow angle.})$$

Evidently then the β angle can be accurately determined if the bow observer keeps sufficient track of the bow angle to determine accurately its maximum and its minimum value during a turn. This is not difficult since the maximum and minimum values are approached and departed from slowly. Of course, if P should happen to coincide with O there would be no change in the bow angle. The nearer P is to the circle BB_1B_2 the more rapid the change from maximum to minimum and the greater the difference between maximum and minimum. It would seem desirable in practice to have P near the center rather than near the circumference.

The stern angle is treated exactly as the bow angle for the determination of γ, and with β and γ known the circles described by B and S are readily drawn.

For convenience in demonstration I have taken the bow angle as measured from B forward—towards L. In practice it will nearly always be more convenient to measure the angle OBS or $180° - \beta$. This is particularly the case if a sextant is used.

The method described above is believed to be novel. It has been tried in practice only with an electric launch under unfavorable conditions, but fairly good results were obtained and no practical difficulties developed.

FIG. 2. CONTOUR CURVES OF $OB \div BS$

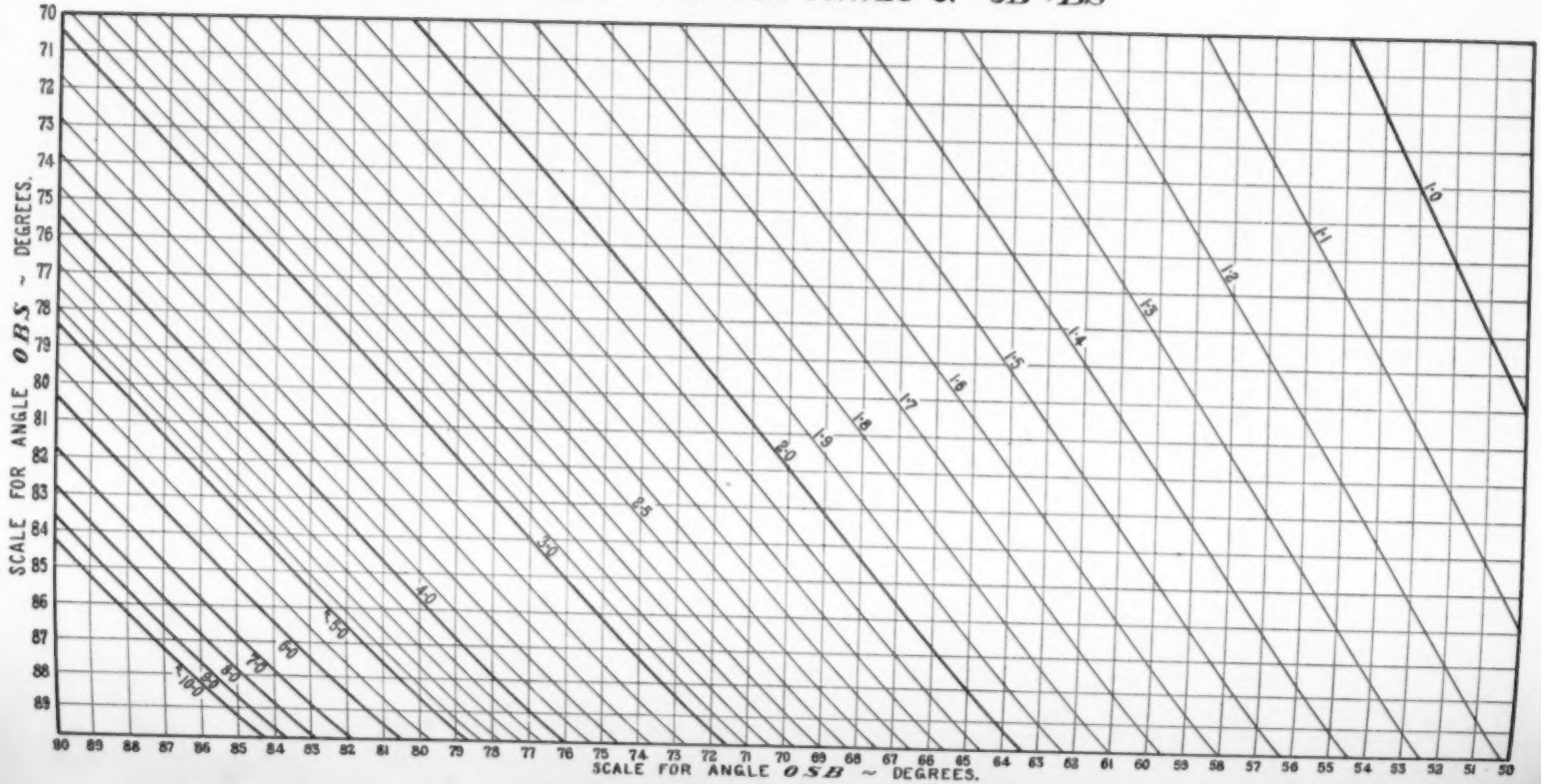
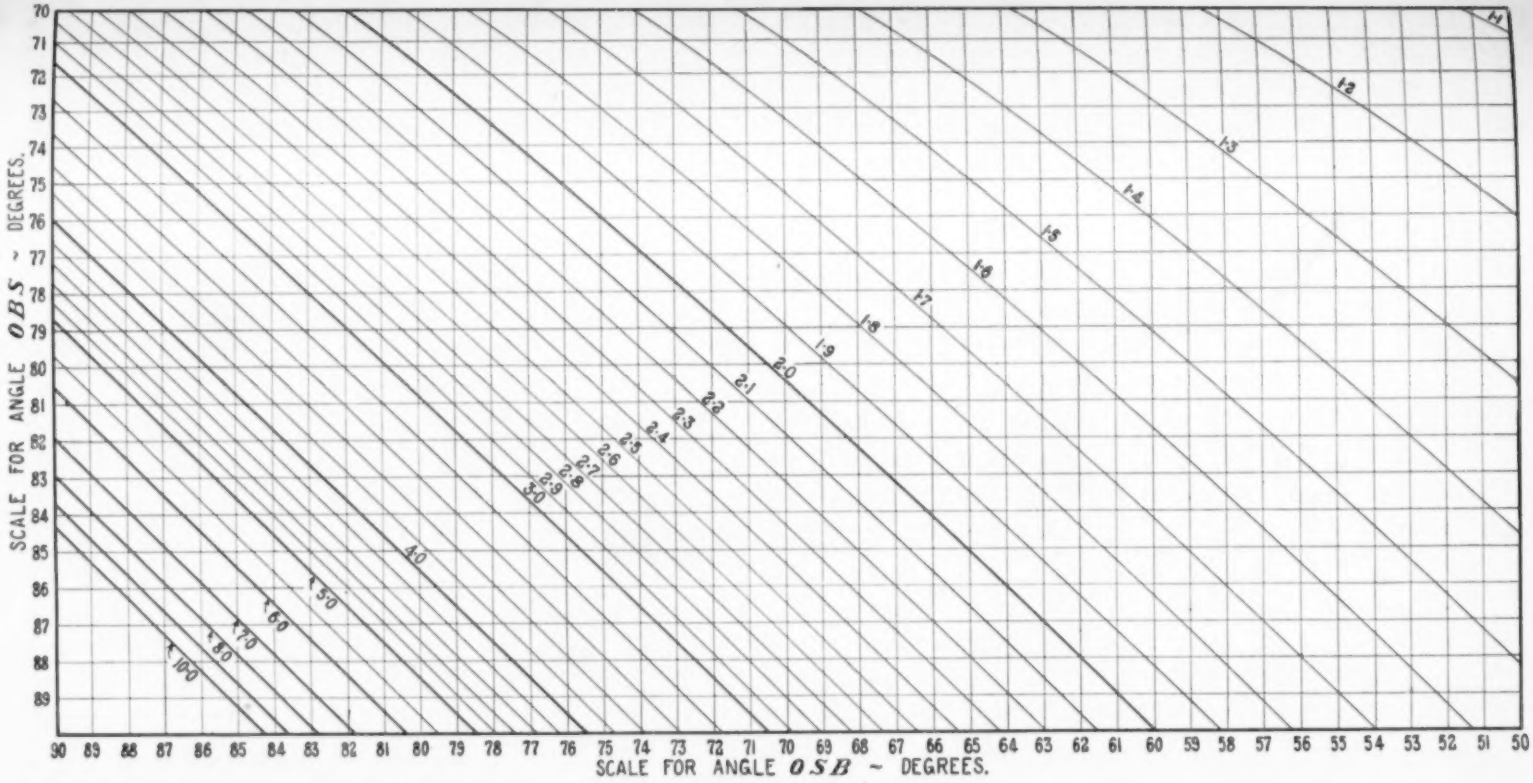


FIG. 3. CONTOUR CURVES OF $OS \div BS$

SCALE FOR ANGLE OSB ~ DEGREES.

FIG. 3. CONTOUR CURVES OF $OS \div BS$



It is easy to make several circles in succession without changing helm, or engine conditions, and the successive final diameters thus obtained will give a line upon the accuracy of the method in practice. As already pointed out, with accurate observations, there are only two conditions required to make the results exact, namely, that the point P should remain at rest while the ship turns and that the ship should turn in a true circle.

Figs. 2 and 3 have been plotted to avoid the necessity of making any calculations when using this method. With BS and bow and stern angles known the value of OB can be obtained graphically from Fig. 2 in terms of BS within 2 or 3 per cent, which is quite close enough for practical purposes.

Similarly OS can be obtained from Fig. 3. The contours in Figs. 2 and 3 are nearly straight, but not quite.

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THE MOTOR DRIVE.*

By Asst. Naval Constructor Richard D. Gatewood,
U. S. Navy.

1. Both in this country and abroad the various phases, and there are many, of this subject have been taken up in papers published by the different engineering societies and journals, and in nearly all cases the writer of such papers, though considering only a particular division of the subject, begins by lamenting the lack of time and space to enable him to do full justice to his article. What then can be said when an attempt is made to treat the entire subject in a comprehensive way in one small paper?

2. In order to keep the discussion within reasonable bounds, every effort toward brevity will be made, as it is intended for those officers who are desirous of knowing where the subject stands to-day, enabling them to decide accurately and correctly the various questions that arise in the course of their work.

3. The applications of the electric motor that come up for the naval officer's consideration are (1) its use in shops, and (2) its use on ships.

Application in Shops.

4. At the present time to discuss the advisability of introducing the electric motor as a "sound and conservative method of furnishing power to shops" would be to display an ignorance due only to woeful lack of reading and observation on the part of any one who is supposed to be conversant with the subject. There are, of course, many other methods of power distribution—

*The writer desires to acknowledge his indebtedness to the General Electric Co. for the courtesies extended to him while many of these notes were being made, and particularly to thank the representatives of that company, Mr. Rohrer, and his able assistant, Mr. Burkholder.

steam, water, air, rope, wire, and belts and shafting all have their proper places. The advantage of the electric drive over any one of these is somewhat involved and depends, of course, upon the nature of the work to be performed, but that the motor is better adapted for many of the forms of shop work than any of those above is now universally recognized. It is practically impossible to give exact figures on this subject, as it is so intimately bound up with improvements in tool steel, with increased modern shop-efficiency methods in general, and with changes in the shop incident to change of drive, etc., but the following facts and estimates are believed to be entirely conservative, and will perhaps serve to give a concrete understanding of this matter.

5. In navy yards the power plant is installed within the yard limits and little question arises over the transmission of power for any considerable distance. In the case, then, of a localized power plant, the general uses of electric motive power are four in number: (1) to distribute the power from the above plant more economically than can be done mechanically; (2) to "take advantage of the singular mobility which electric distribution permits" in getting the full use of the portable machine tools that are now being turned out in such numbers; (3) to introduce electric traction within the yard limits; and (4) to admit of economically centralizing the mechanical plant for supplying light, heat and power.

6. The advantages of electric drive over mechanical transmission are as follows:

(1) Cheaper power.

(2) Increase in output.

(3) Better control and steadiness of power.

(4) Greater speed range.

(5) Greater convenience in arranging machines and materials.

(6) More economical disposition of floor area.

(7) The ability to shut down departments without interfering with other departments.

(8) Almost instantaneous response for sudden demands of power.

(9) Ease with which additions can be made.

(10) *Increased cleanliness.*

(11) More effective light and sanitation due to better grouping.

(12) Reduced cost of repairs and maintenance owing to absence of shafts, pulleys, hangers, belts, gears, etc.; also owing to simplicity and fewness of parts of motors.

(13) Reduced cost of building when planned or when reconstructed for motor drive.

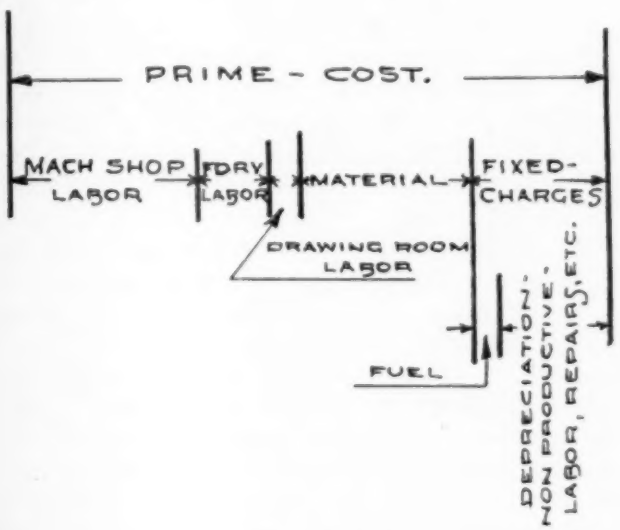
(14) Size of shafting can be much smaller in case of small machines because they can be grouped and power applied to shafts near center of their length.

(15) Volts and amperes being more easily measured than torque and speed, the power consumption can be more definitely determined for a tool, and so a more nearly exact and more useful estimate formed of work capable of being turned out.

(16) In a general way the field of work is broadened, leading to developments impossible by former methods.

(17) Elimination of complication and physical effort in handling machines.

(18) Full power limit of machines utilized.



CHEAPER POWER.

7. The mere economy in power is not so potent as some electrical firms endeavor to make it seem. A glance at the accompanying diagram will convince one of this fact. From this it is seen that the cost of power is only about 2.1 per cent to 2.5 per

cent of the cost of the finished article. As a matter of fact, from a comparison of reports on tests of power plants from the different navy yards, it is fair to assume the cost of steam power to be about $55.00 per horse-power per year (3000 hours). With belt and shaft system, it is estimated that the cost of this power would amount to about 2.5 per cent of the value of the output; with motor "group" drive it would amount to about 1.8 per cent of the value of the output; with individual motors on all large tools (above 3 horse-power), it would amount to about 1.2 per cent. Assuming a yearly output of $500,000, the result is:

Drive.	Cost of Power.	Saving.
Belts and shafts.....	$12,500	
"Group" drive	9,000	$3,500
Individual motors	6,000	6,500

These figures are rather conservative, but serve at least to give an idea of what is meant by a decreased cost of power. In connection with this yearly saving of $6500 must be considered the increased first cost of the plant equipped with motor drive; it will be found that the *interest on the increased cost exceeds the saving of $6500.*

8. In this subject of cost is always to be considered the question of whether a new shop is to be installed or whether the old shop is to be fitted with motor drive. Of course, in the case of installing a new shop (which we will suppose to have the same output as an old one with belt and pulley drive), it must be remembered that if a great saving of power can be effected, the first cost of the power-producing plant can be materially reduced, which will help to counterbalance the increased cost of the machines in the shop itself.

9. On this question of a saving of power, it would be well to have definite figures for general use, but, as before stated, it is exceedingly difficult to obtain any reliable authoritative data on this matter. A close examination of the engineering press for the past few years will result in finding a number of articles nearly all of which give some presumably reliable figures on the subject; but when the methods of obtaining these figures are analyzed, it is found that in nearly all cases the premises are false and the hypotheses untenable. As an example of this may be mentioned one method which to a number of investigators appears very attractive, largely, no doubt, for the reason that it is

apparently so simple and logical. The amount of power required to run the particular shops under investigation was determined either by electrical instruments or by steam indicators, when running with and without load. The difference of the two readings was presumably the loss. The wrong assumptions are (1) that the frictional load of the bearings does not change with the amount of load; it does; (2) that the pull of the belts does not set up strains in the shafting which cause losses, probably as great as the losses in the bearings. The following figures, while not scientifically exact, are believed to be at least conservative; and while they cannot, perhaps, be applied to all cases that arise, they will serve to give something definite on this interesting phase of the problem.

10. Suppose a certain maximum H. P. is required by all of the tools of a shop (say 100 horse-power), then it is required to have at least 80 horse-power to transmit this effective power by belts and pulleys and shafting. This loss of 80 horse-power remains constant whether or not the effective horse-power is reduced; thus there must be generated 180 horse-power. Now should these same tools be driven by individual motors instead of by shafting, only about 50 horse-power is required for transmission, even if every tool be running. But in the average shop every tool is not running at the same time, some being shut down and others operating on less than maximum horse-power. In the average manufacturing establishment it has been determined that the mean effective power used is but 60 per cent of the average effective power required when all of the tools are running at a maximum load. This percentage is called the load factor. In the case, then, of a belt drive, we have 80 horse-power losses for 100 horse-power effective load, hence 55.6 per cent efficiency. With 60 per cent load factor there is but 60 horse-power to use, and as it requires 80 horse-power to transmit it, the efficiency is 60/140, or 43 per cent. With the individual motor the loss varies with the load. Taking the same load factor as before, and assuming 60 per cent to be the loss incurred by operating with 60 horse-power effective load, there is but 60 per cent of 50 horse-power loss against 80 horse-power with belt drive. Thus with individual drive there is generated 90 horse-power of which 60 horse-power is effective, giving an efficiency of 60/90, or 67 per cent, as against 43 per cent with belt drive.

11. The effects of variable and constant speed motors must also be considered. Assume that 60 per cent of the motors are to be variable speed motors; these will have a rated capacity somewhat higher than they will be called upon to supply. Assume that the other 40 per cent have rated capacities the same as they are to supply; as their speed is constant this assumption is justified. Of the total rated capacities of all of the motors, assume that 56 per cent represents the mean power that all the motors are required to turn out, if all are running at the same time. Applying same load factor, 60 per cent, we find that the average power to be supplied to the motors is 33 per cent of the total rated capacities of the motors. This 33 per cent cannot be assumed to represent the capacity of the generating plant, but the figures will give an idea at least as to what is meant by cheaper power. It may be added that in the installation of motor drive in a shop where all the tools to be installed can be foreseen at the outset, and where no further provision need be considered for the addition of such tools in the future, it has been found good practice to install one generator horse-power for every four motor horse-power.

INCREASED OUTPUT.

12. Now as to the question of increased output: In this are involved many points worthy of consideration. First of all, it is found that the increased output is due to three things: (1) Better control of machines; (2) greater speed range, thus enabling the machines to be used at their full power limit; and (3) eliminating complication and physical effort in handling machines. The "more subtle factors, such as sanitary conditions and light," must also be considered. The methods of control and the elimination of physical effort will be taken up later in detail (see photographs of installation) but a word or two here will be in order.

13. As shown in a previous diagram, the value of direct labor is some 55 per cent or 60 per cent of the cost of production, and any method of reducing the time spent upon a given piece of work is of course a very important one. The object of machine-shop work, as everyone knows, is to do a given piece of work most efficiently *the first time*. Now, this "piece of work" in question varies greatly in kind. Heavy cuts and coarse feeds can be used on some work and not on others; some work requires

constant speed, some varying speed. The question of constant and varying speed motors is considered later, but this can be said now; that where work is heavy and speed has to be varied often, or where work is light or of but short duration, it is essential that "ease of handling" be obtained. Also, in heavy work particularly, we naturally want to work the machines up to their full power limits all the time, and to do this we must know the value of several important factors before we can save time. We must know the kind of work, the character of the metal to be machined, the uniformity of tool steel and the size of cut it will pull, and the most severe work that will be required of the machine.

14. Taking a concrete example, let us suppose that certain castings have been received, some of steel, some of wrought iron. A definite amount of metal must be removed and a certain finish given in the shortest possible space of time. How can we do this? The cutting speed for steel is determined by the tensile strength and elongation, while for cast iron the hardness is affected by chemical composition, method of cooling, and size of casting. Knowing these, and we can determine them rather simply, it is possible to determine approximately the speed to be used in cutting. It is then merely a matter of knowing which notch of the controller and which gears to use, and the speed is obtained in a moment. Too close speed regulation is not necessary because estimates, even the best, cannot be much closer than 10 per cent or 20 per cent.

15. In work of varying diameters and requiring varying speeds, especially on large machines, "it is impossible to have the machinist shift his belt as often as he should, as by so doing he would be physically worn out by the end of the day; or if such a condition could be arrived at, it would last only a short time, the workman soon relaxing his efforts until the old conditions exist again. The motor, with its great facility of control, removes all these difficulties." The above quotation is perhaps exaggerated, but there is unquestionably much truth in it. In addition to the loss of output due to not shifting belts, there is, in a great many cases, an added loss due to improper belts, they being too narrow or not properly tightened, both of which faults can greatly reduce the output. From a careful comparison of all of the data at hand on the subject, it is estimated that machine tools equipped with electrical motors will show an increased output throughout a navy yard of 20 per cent over mechanically driven tools.

BETTER DISPOSITION OF FLOOR AREA, MORE LIGHT AND SANITATION, ETC.

16. A glance at the accompanying photographs, Nos. 1, 2 and 3, shows the enormous advantage gained in the use of motors on machine tools in obtaining best location of tools, disposition of floor area, and clear head room for crane service. In constructing a plant equipped with line shaft drive it is necessary to supply sufficient additional strength to carry weight of shafting, pulleys, etc., to make higher side walls with greater light area to balance that lost through obstructions of above mentioned pulleys, belts, shafting, etc., thus adding to the first cost of the building, and the structure would have to be larger to accommodate the same number of machines as the motor-driven building. As seen from pictures and from actual calculations, the amount of floor space needed to install a given number of motor-driven machines is only about 60 per cent of that required for successful line shaft operation. It is useless to enlarge upon this well known fact any further.

COST OF REPAIRS.

17. The question of repairs and renewal of parts has received but scant attention, particularly at the hands of those writers on this subject who are interested from the electrical point of view, and is usually glossed over with the statement that "it is well known that properly installed electrical apparatus needs almost no repairs." Experience at a number of navy yards shows that the repair bill covering motors is a rather large item, and shows further that direct connected motors give considerably more trouble than motors belted to line shafting. These troubles are principally in the controlling apparatus; the coils in series with the field magnets and the starting coils give trouble. There is also a continual renewal of the contact points of circuit breakers. Then come commutator troubles, necessitating at times complete new commutators. It is believed, however, that the cost of repairs to an electrical installation is considerably lower than the cost of similar repairs on a belt-driven installation.

BEST ELECTRICAL EQUIPMENT REQUIRED.

18. In order that the above advantages and figures may hold, great care should be used in the first place to select the best electrical machinery. The accompanying diagrams, taken from an

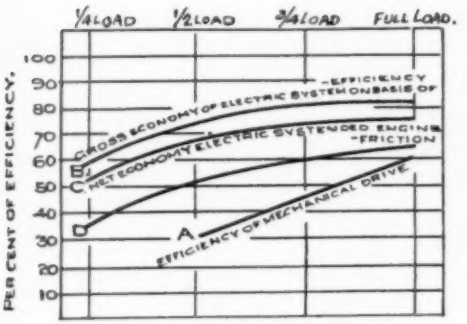


FIG. 1.

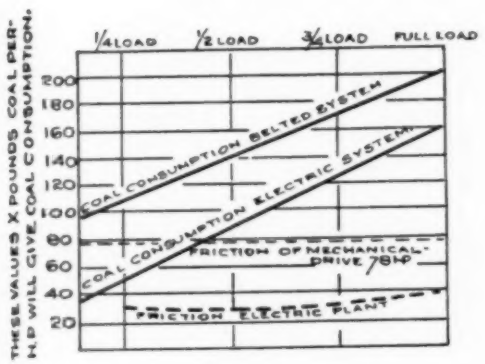


FIG. 2.

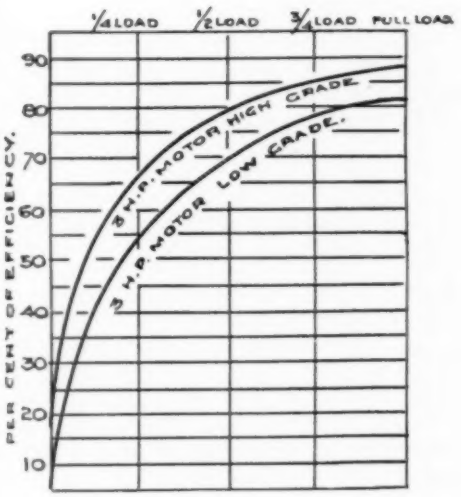


FIG. 3.

excellent article in the Central Railway Club Journal, illustrate this point very clearly. In Fig. 3, "*A*" is the efficiency curve of a three horse-power motor of inferior design, compared with "*B*," the curve of a well designed motor. Fig. 1 shows the efficiency in percentage of an actual factory operating under various loads, "*D*" being the curve of electrical efficiency when poor machines are used. Fig. 2 shows the relative coal-pile efficiencies. A glance at these curves, and the story is told of a great many motor-drive advantages.

GENERAL ADVANTAGES.

19. It would be hard to estimate the advantages due to increasing the field of work of machine tools and to producing developments not yet heard of. One authority says of the belt and drive system, "It is not a question of does it fulfill present conditions, but will it meet new requirements resulting from the advance in tool steel and our better knowledge of the subject? It certainly will not." There is also another general statement frequently made which must be given considerable weight. By increasing the production of separate machines, the efficiency of the whole shop is also greatly increased. Other machines are driven faster to keep up with the increased output of those machines performing the prior operation on the same castings; increased handling facilities are introduced to take care of the increased output; modern methods of routing are brought into use, and the entire "tone" of the shop is raised.

DISADVANTAGES.

20. The chief disadvantage is the increased first cost. Actual figures are difficult to give, but it is believed entirely safe to say that in order to install a given number of tools in a building especially built for motor drive, it will cost about 50 per cent more than when built for belt drive. There are other disadvantages of more or less importance such, for example, as that due to disturbance of operation when conduits are flooded and serious grounds are encountered in the mains, or when the navy yard is obtaining a portion of its power from private corporations and the power is interrupted from time to time; also that higher priced men are required to effect electrical repairs than are required in case of belt installation. Considering, however, all the

advantages as shown from data collected on the subject of good shop practice, the disadvantages are far outweighed, and no more attempt has been made in the foregoing facts to argue in favor of the motor drive as a reliable and thoroughly trustworthy economical method of transmitting power than would be made in discussing the facts connected with such solid improvements as the card index, loose leaf ledger, modern systems of ventilation, and the like.

APPLICATION OF ABOVE FACTS.

21. We now come to the actual practical application of the above facts. The conditions that arise are two; we have either to design and install the new plant, or we have to make over the old plant. In navy yard work the latter is the more usual. First of all, the kind of work must be known. Then the question of speed enters at once, coupled with cost. It seems to be the practice of the best tool-builders to equip all machines above say 3 horse-power with individual motors. Machines below 3 horse-power are grouped and one motor is used to drive the shaft from which each group takes its power. Just where to drop individual motors and where to take up the group drive is a much disputed question, but the above figures hold in a fairly definite way. Consider now the case of an old shop where machines are to be fitted up with motor drive. To quote from an article by G. A. Damon in the A. I. E. E., 1902, p. 177: "It more often happens that the tool shop equipment is to include a number of tools which have already been used in the old shops and which are poorly adapted to the direct application of individual motors. Take the example of a group of lathes driven by belts from speed cones. To put an individual motor on each lathe would require a multiple voltage or double commutator system of speed control, either of which would involve an investment in motors, controllers, and wiring at least six times as large as the cost of one line shaft motor to drive the entire group, and in addition to this is the expense of special brackets and mechanical connections between the motors and tools. Under these circumstances, it is problematical whether or not the extra investment in electrical equipment is to be justified. The tendency at present seems to be to arrange the old belt-driven tools in groups allowing a 10 to 20 horse-power motor for each group."

22. This, then, seems to have been the practice in 1902. There has been much improvement since then in the knowledge of the

application of motor drive, and though moderation is still used, and must be used, the practice now seems to be to group only tools under about 3 horse-power and to run others with individual motors, the advantage being not so much a question of efficiency as of convenience and shop output.

ALTERNATING CURRENT, OR DIRECT CURRENT.

23. The next question that arises is whether the shop is to be equipped with A. C. or D. C. motors. The uses of the two are contained in the following table:

Alternating Current.	Either.	Direct Current.
Saws,	Constant speed machines in general.	Millers,
Pumps,		Boring mills,
Spinning machines,		Cranes,
Wood work,		Slotters,
Constant speed machines in general.		Shapers,
		Planers,
		Screw machines,
		Variable machines in general.

ALTERNATING CURRENT.

24. Now just where does the use of A. C. stand at the present writing; when is it used; why; how controlled, and what is its efficiency, relatively speaking, compared to D. C.? An attempt to answer definitely the above questions will be given below.

25. In general, the particular layout of the shops, the distance the power has to be transmitted, and the lighting of the yard with its buildings, determines whether A. C. or D. C. shall be used. For the benefit of those not thoroughly conversant with the subject of A. C., let us go to the root of the matter as briefly as possible. Quoting from an excellent article by Mr. Pomeroy in the Central Railway Club:

26. Since the amount of copper varies directly as the resistance of the circuit, which varies inversely as the square of the electromotive force, or to express it in a formula,

$$\text{Amount Cu.} \propto R \propto \frac{1}{E^2}$$

then 100 times as much copper is required for delivering a given current at 100 volts as for delivering it at 1000 volts. If the pressure is increased to 10,000 volts, the size of the wire required is 1 per cent of that necessary for 1000 volts, and is but .0001 part of that demanded by a 100-volt current.

"The ideal system must transmit at high pressure and use at low pressure; it must transmit the 10,000 volts and, for example, transform it to 1000 amperes at 1000 volts.

"There is no apparatus for effectively transforming D. C. from high to low pressure, while the A. C. is readily and simply transformed. It is this characteristic that has given the alternating current its great success.

"The description of the induction motor is negative; no commutator, no collector rings, no brushes, nothing to handle but a switch, nothing to wear but self-oiled bearings, no exposed parts, no danger from fire; the machine composed of rotor and stator."

27. The characteristics of the induction motor are much the same as those of an ordinary D. C. shunt motor, *i. e.*, its speed tends to remain constant when the impressed voltage and the frequency are constant. Within certain limits, say 10 to 15 per cent, for a given frequency and a given number of poles the speed is practically fixed and independent of all other effects, except the effect of resistance in the secondary circuit. By varying this resistance, however, we may vary the speed down to zero, and this is true for a 2-phase or a 3-phase motor, as their construction is practically identical.

28. There are four ways in which the speed of an A. C. motor may be varied practically:

(1) Varying the potential applied to the primary with suitable resistance in the secondary. In regard to this method, it can be said that the efficiency is low, there is a large heating effect in the motor itself requiring a large motor, and the method is unstable at low speeds.

(2) Varying secondary resistance. This is the simplest method and the easiest to control, giving full range of speed, but it is not efficient.

(3) So changing the primary connections as to change the number of poles.

(4) Changing frequency of E. M. F. Every induction motor tends to run at synchronous speed— $\frac{60 \times \text{frequency}}{\text{pairs of poles}}$, so that if we impress a different frequency we get a different speed.

29. These last two are considerably more efficient than the two first, but do not permit of as large a speed range. Number 2 is the method most generally used.

30. An induction motor is cheaper than a D. C. motor, but by the time we have paid for transformers and installation for speed control we lose most of the advantage of the saving in copper and the cheaper motor. The repairs on an induction motor amount to almost nothing, and where a constant speed is desired they are much superior to a D. C. motor. The alternating current motor admits of much greater overload with no appreciable change in speed than a D. C. motor. At the present time, however, where anything like varying speed is desired a D. C. motor is, on the whole, decidedly better.

DIRECT CURRENT.

31. Having decided, then, that we cannot obtain a close, efficient speed control and ease of handling on a constant speed (A. C.) motor, what sort of D. C. type shall we use? Shall we use a standard constant speed, or a special type of motor, and how shall we obtain the speed range?

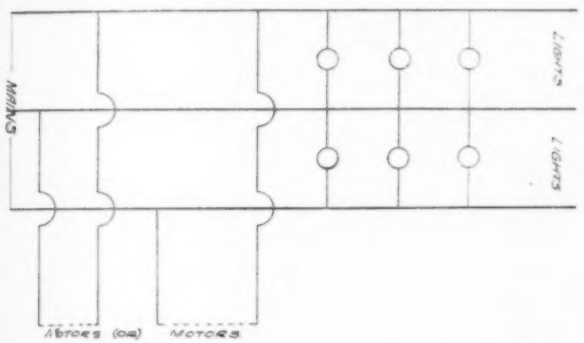
32. The uses of the three forms of D. C. motors, series, shunt, and compound, are too well known to need further comment. In general, we may say that the series motor is used where variable speed and good speed regulation is desired, the shunt motor where constant speed is required, and the compound motor where a good regulation but not too constant speed is wanted.

33. There are at present four ways of obtaining this speed variation: (1) multi-voltage; (2) three-wire; (3) two-wire; and (4) mechanical variable speed regulators.

34. By means of the multi-voltage there is no doubt but that the most exacting requirements of speed range can be met. In this system the primary voltage impressed upon the motor may be varied into as many steps as the number of wires will give combinations, giving, of course, as many different speeds. These, combined with the pulleys or back-gears in the case of direct drive, will give any speed that might be considered necessary. But such a large speed range and combination of speeds is not needed practically. The multi-voltage system requires balancer sets, as they are called, to take up the difference of voltage between lines, expensive and somewhat complicated interlocked switches, and, in general, more complication and first cost. As now manufactured, variable speed motors fulfill practically all the modern requirements covering range of speed, and the writer does not believe that

the multi-voltage system will come into prominence in any future installations.

35. The Edison 3-wire system is too well known to need explanation, and, in the opinion of the writer, is the most economical and satisfactory solution of the problem. The sketch shows the most satisfactory installation for a navy yard. The lights are on a 3-wire circuit as usual, and the motors on only 2-wire; but by means of a small switch at each motor the circuits can be shifted to the neutral wire. By this system, constant speed motors with range of three to one speeds (500-1500 R. P. M.) can be used, and a sufficiently great range of speed obtained for all practical pur-



poses. Much saving in copper and complication in wiring and apparatus is effected, and the system has proved eminently satisfactory and efficient. For a ship the two-wire system is most satisfactory. The reason for this is that the distances are small, and the increased complications due to three wires more than offset any other advantages of such a system.

COMBINED A. C. AND D. C. INSTALLATION.

36. A combination of the two currents is often the most satisfactory one for a navy yard. This is particularly the case in such yards as Mare Island, Bremerton, and others located near a large source of supply for A. C. current. Power can usually be purchased from the controlling corporation at a very reasonable cost, and constant speed machines for driving line shafting, for group drives, for elevators, for tools in shipfitters' shop, and a large number of wood working tools, can thus be driven by induction motors. With such a system the principal difficulty is found in

the fact that the navy yard has no control over the supply of current, and in case of a break-down or temporary loss of power, which is quite frequent owing to the long distance over which the current is transmitted, there is a constantly recurring loss of time. In a great many cases the pecuniary loss to the government is practically impossible to determine, and therefore cannot be deducted from the bill of the power company. On the whole, however, it is the opinion of the writer that such a combined installation is distinctly a good one.

SPEED REGULATORS.

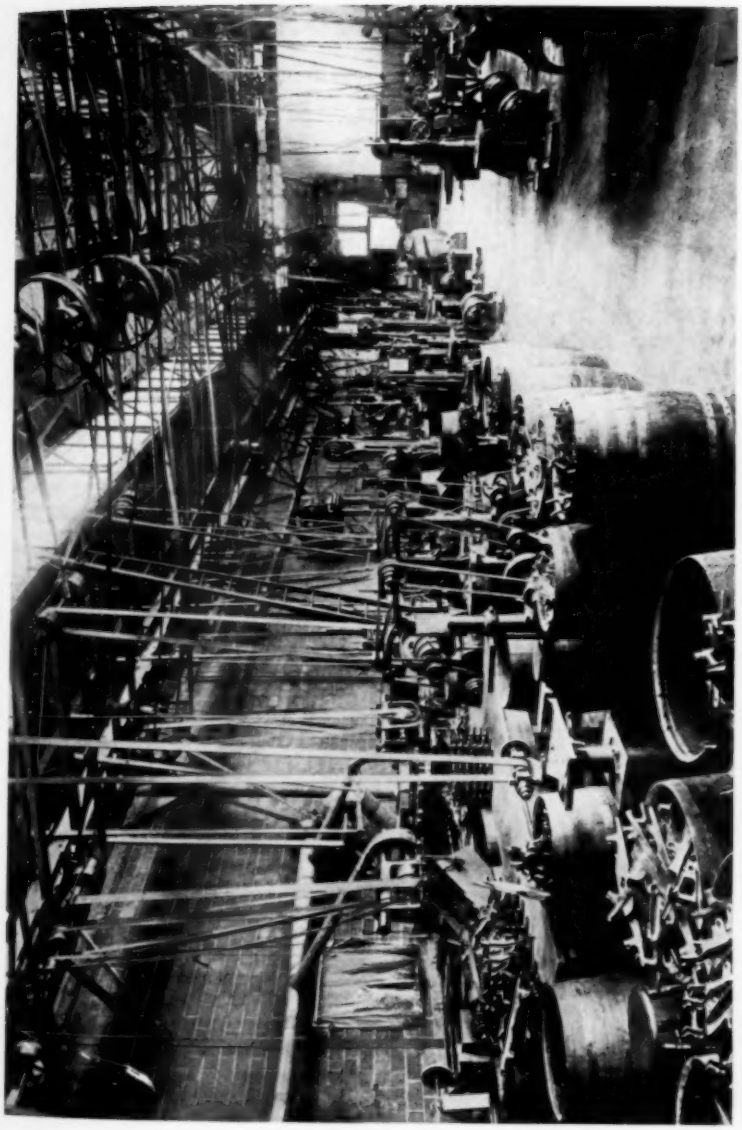
37. Of mechanical speed regulators, it only remains to be said that as yet, so far as is known within the experience of the writer, no satisfactory one has been developed. There are many ingenious patents out for this much needed article, but after looking into quite a number of the claims it can be said, with but little fear of contradiction, that an entirely efficient one has not yet been put into actual practice. It is probable that the development of such a device will be perfected along the following lines:

(1) A thoroughly satisfactory mechanical chuck, capable of universal application, should be developed.

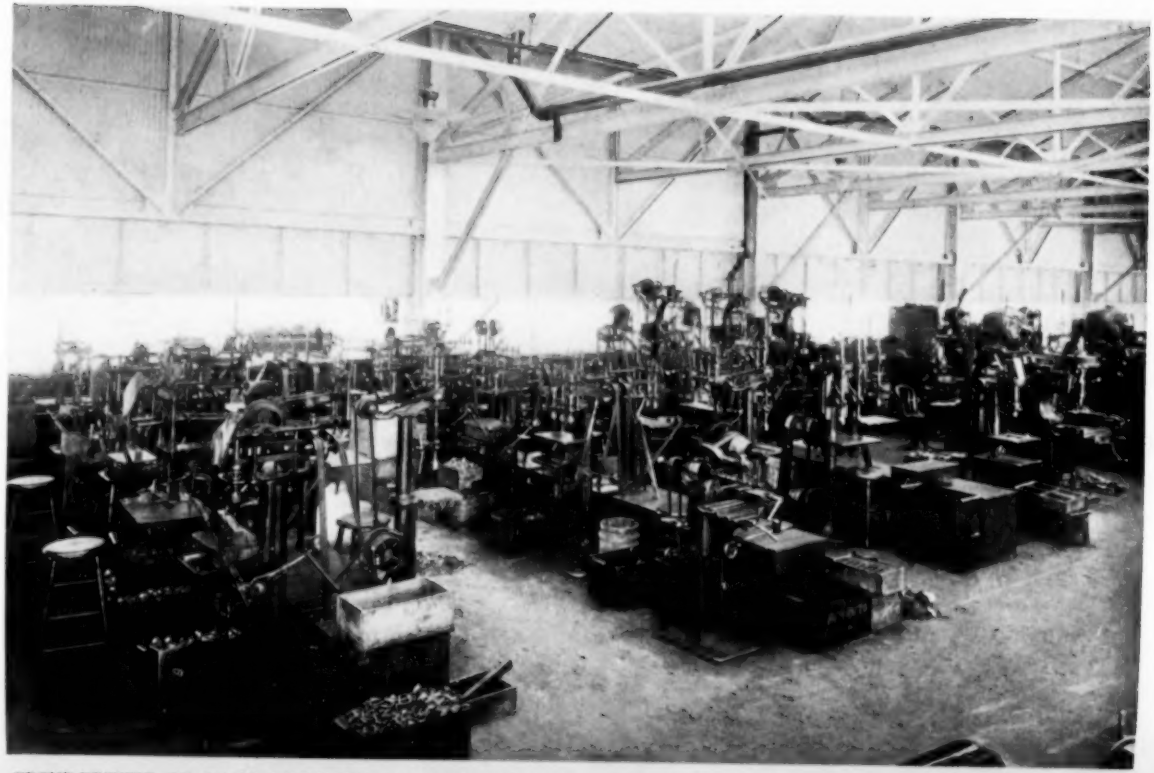
(2) An efficient mechanical clutch should be brought out. The steps between such a clutch and a speed regulator would then be considerably shortened.

APPLICATION OF MOTORS TO TOOLS.

38. Let us suppose, then, that after due consideration of the problem as a whole, and after an application of the foregoing principles, it has been decided to adopt a certain installation for a new plant, or for equipping an old plant with motors; the power has been carefully proportioned to (1) work requiring constant speed, and (2) work requiring variable speed; and the machines are to be grouped or given individual motors according to the solution of this rather involved problem. In general, it is well to remember that an excellent plan, and one worthy of a considerable amount of sacrifice in smaller matters, is to install standard types and as far as possible to have units all of the same type; *i. e.*, standard types, of the same design and horse-power. Something has already been said of the size of motors to use, but practically,

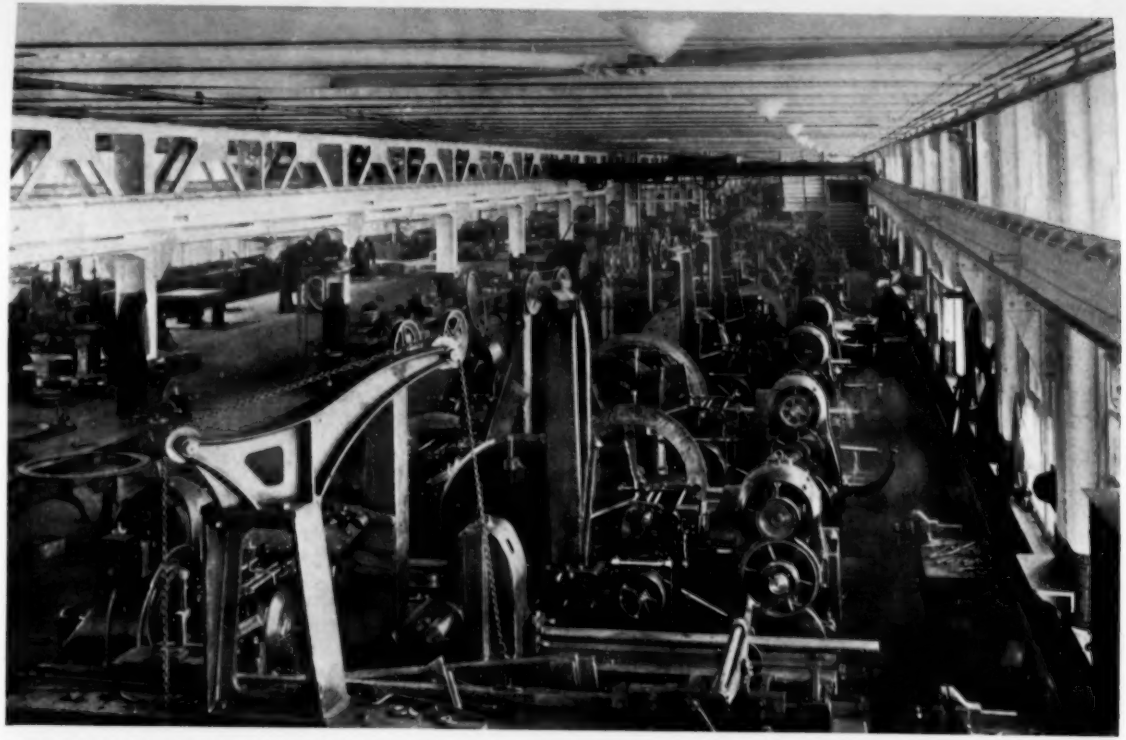


BELT-DRIVEN TOOLS, BUILDING NO. 29, SCHENECTADY WORKS, GENERAL ELECTRIC COMPANY, 1905.

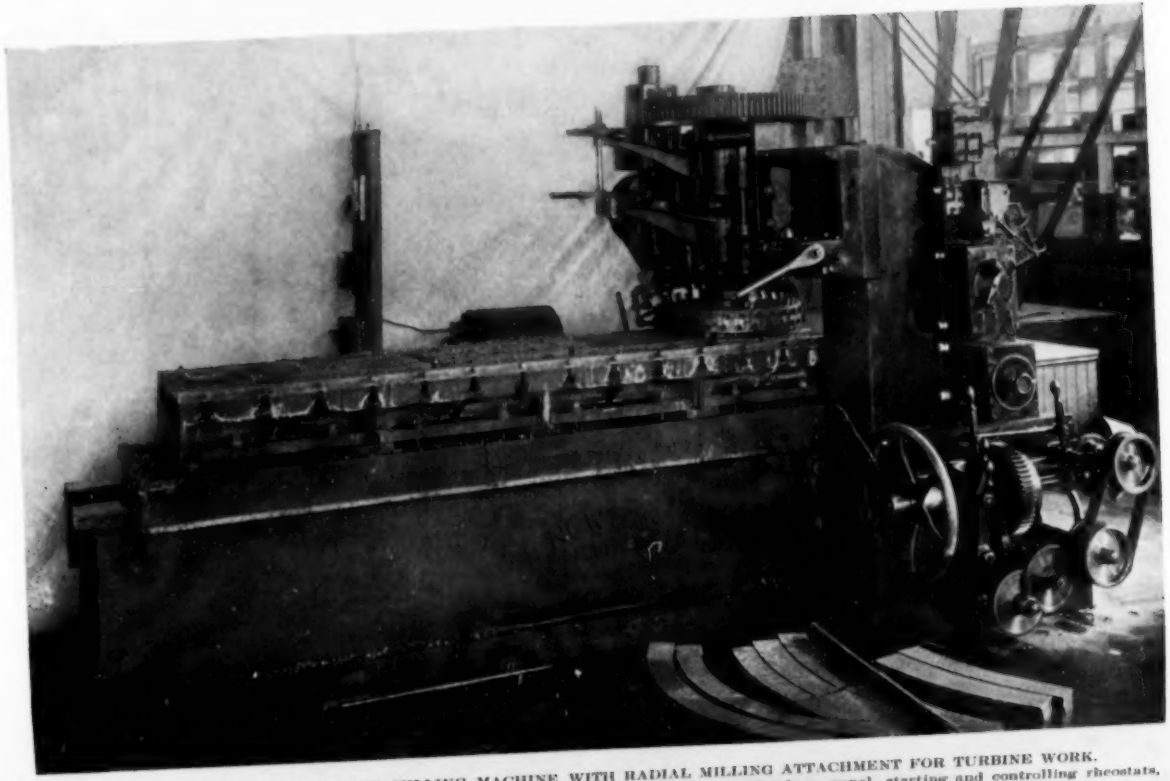


GROUP-DRIVING OF SMALL MACHINES, GALLERY, BUILDING NO. 86, SCHENECTADY WORKS, GENERAL ELECTRIC CO.

GROUP-DRIVING OF SMALL MACHINES, GALLERY, BUILDING NO. 86, SCHENECTADY WORKS, GENERAL ELECTRIC CO.

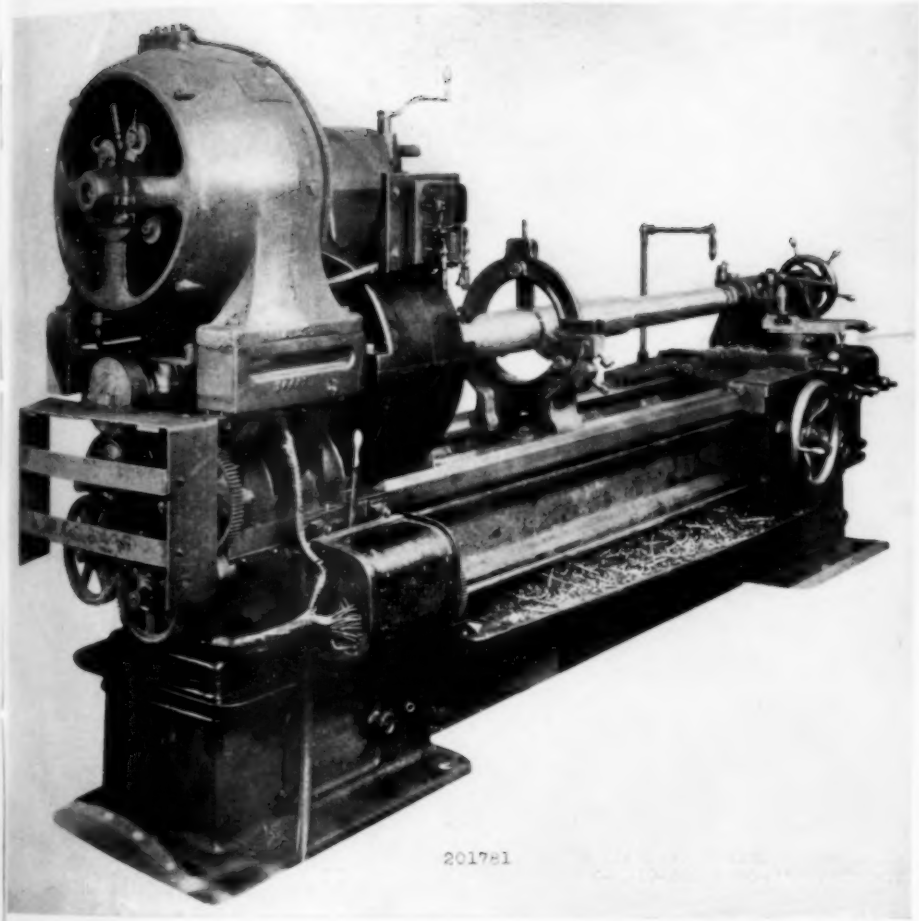


SHOWING CLEAR HEAD NOW OBTAINED BY MOTOR-DRIVEN TOOLS; BUILDING NO. 86, SCHENECTADY WORKS, GENERAL ELECTRIC CO.



NEWTON HORIZONTAL ARBOR MILLING MACHINE WITH RADIAL MILLING ATTACHMENT FOR TURBINE WORK.

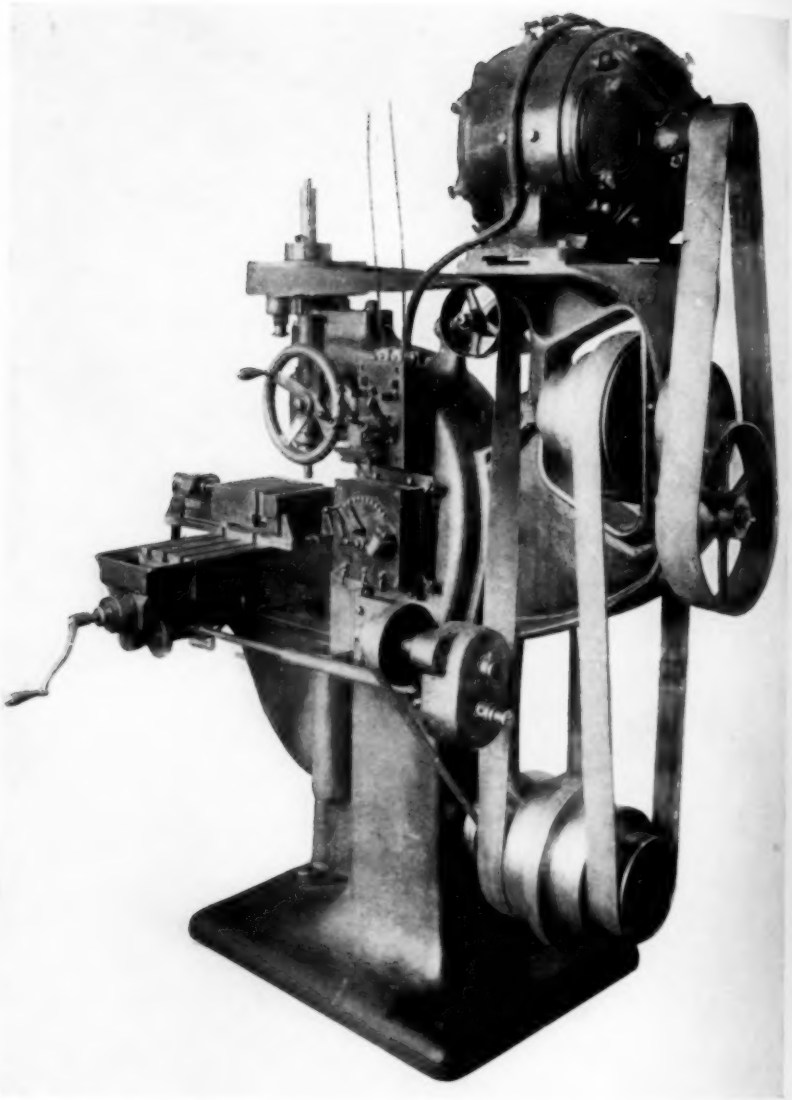
Showing very cheap form of installation, motor mounted separately, furnished with cheap panel, starting and controlling rheostats, etc., mounted one above the other on separate panels.



BULLARD FINISHING LATHE EQUIPPED WITH CK-6-10-600/1000-250 VOLT MOTOR.

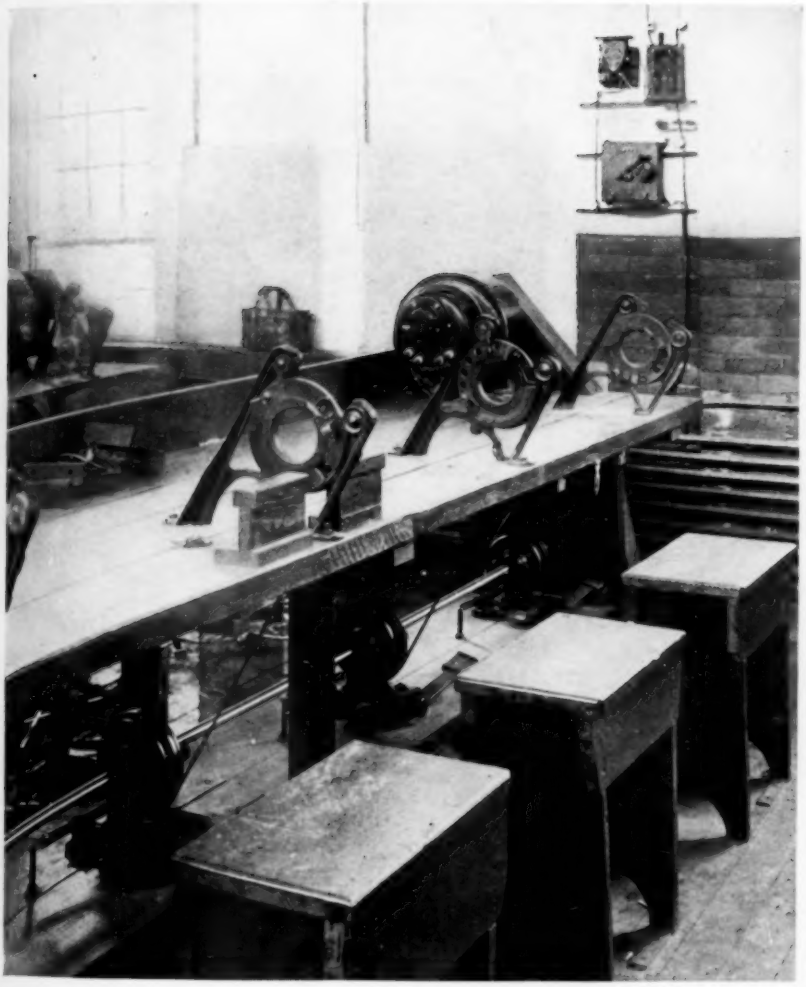
Showing raised installation motor on large lathe. It would have been much better to install motor under the machine, as in the case of the 18" Reed lathe shown later. The arrow points to the controlling lever, which is on the apron, and enables the operator to control the speed and watch the work at the same time, which is an excellent feature. The vibrations due to this raised installation on heavy lathes tends to decrease the machine's capacity and to add considerably to the repairs.

Showing very cheap form of installation, motor mounted separately, furnished with cheap panel, starting and controlling fuses, etc., mounted one above the other on separate panels.



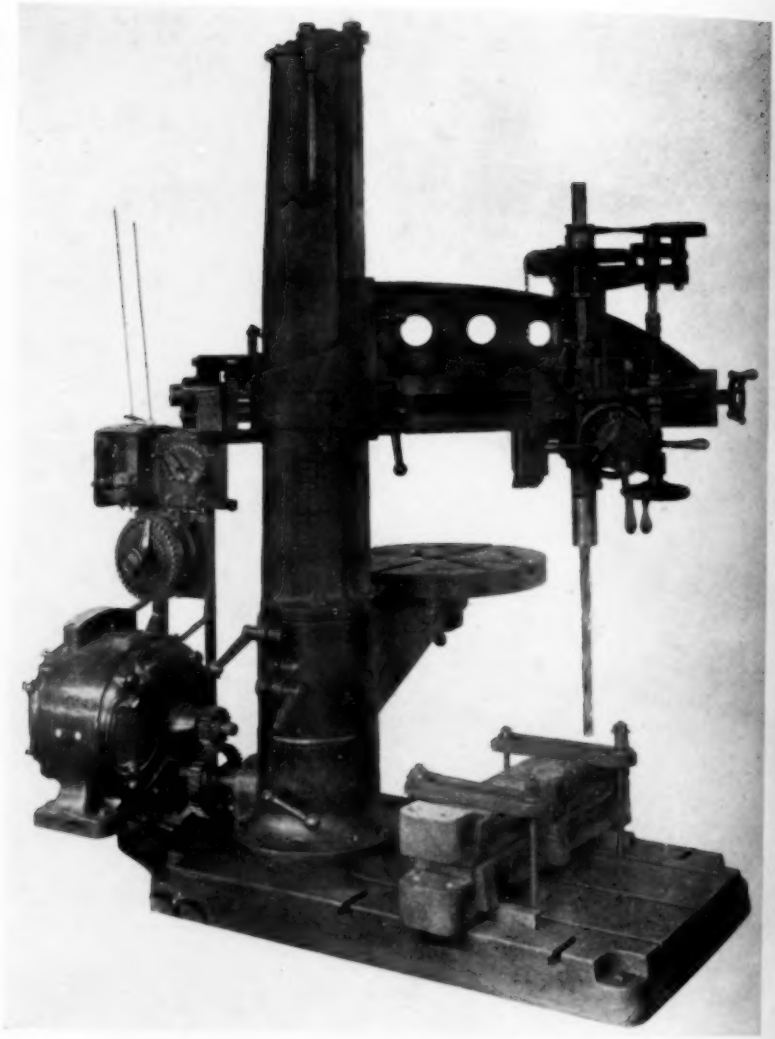
NO. 4 BECKER PROFILER EQUIPPED WITH CE-2-3-1100-230 VOLT CONSTANT SPEED SHUNT WOUND MOTOR.

Showing method of equipping a variable speed tool, that was previously operated from belt and pulley drive, with a constant speed direct current motor. The rough bracket upon which the motor is mounted is simply a rough casting, and, but little machining being necessary, the change from belt to motor drive can be very cheaply made.



BENCH (7) TAPING MACHINES EQUIPPED WITH CA-2-H. P.-1100-230 VOLT CONSTANT SPEED SHUNT WOUND MOTOR.

Showing motor operating group of tools. The motor is installed above the table in order to prevent inconvenience and trouble due to dust. A better installation would be an induction motor, which could be installed under the table well out of the way. The installation of the line switch and controller is to be noted as showing a cheap and undesirable installation.

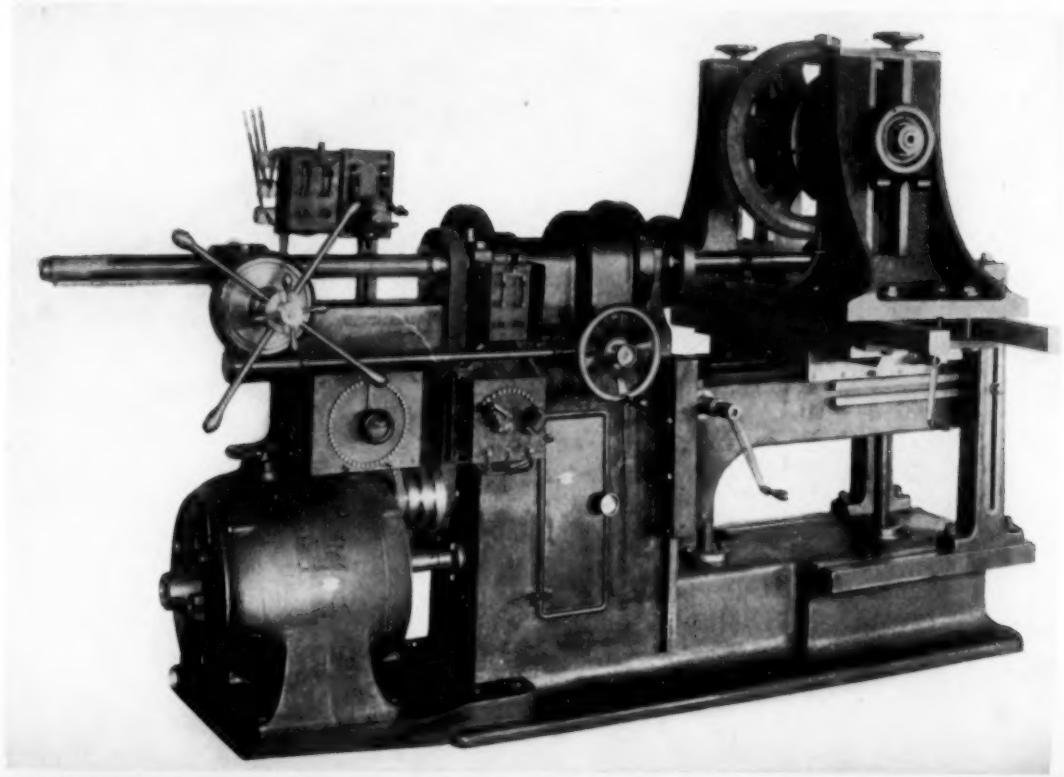


CE 1½ H. P. MOTOR OPERATING DRESES, MUELLER & CO.
3-FT. RADIAL DRILL NO. 3645.
BUILDING NO. 29, SCHENECTADY WORKS, GENERAL ELECTRIC CO.

Showing a very neat installation of a small drill, motor-driven. The motor is installed on the floor of the shop to prevent vibration. Note the neatness and compactness of the line switch, controlling apparatus, etc. The gears should be protected from stray chips by dust guards.

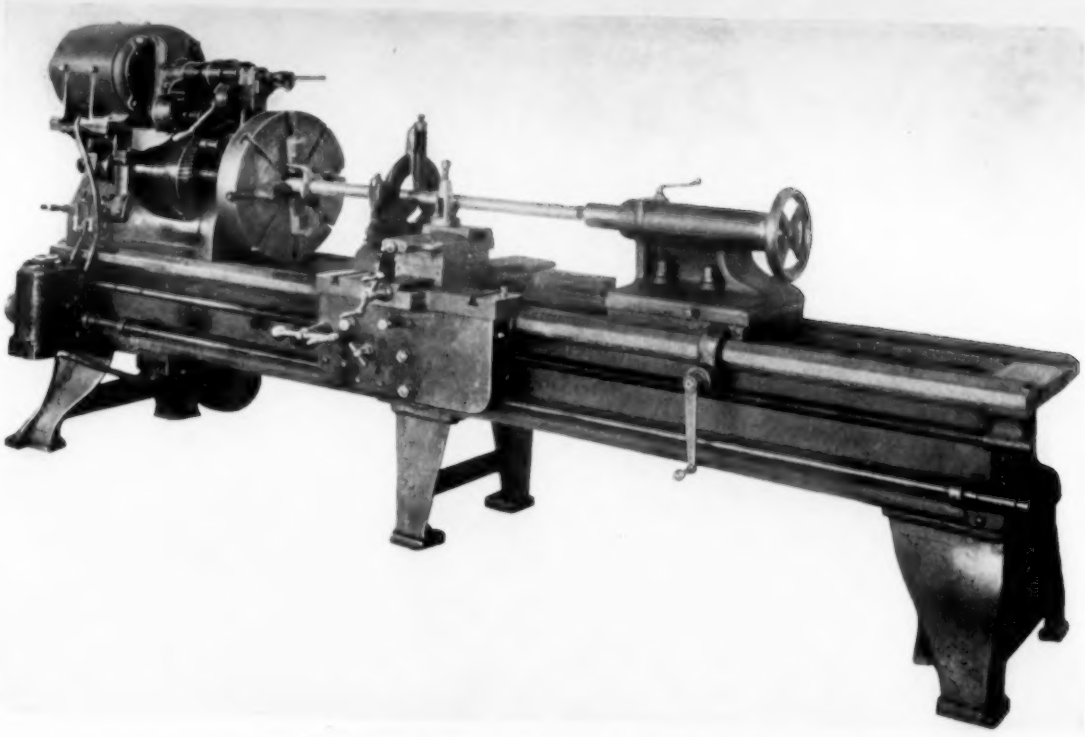
96" NEWTON PORTABLE SLOTTER EQUIPPED WITH IB-2-8-1500-250 VOLT MOTOR.

Showing large slotter, motor-driven. The motor can be placed in its raised position without fear of vibration, due to the massive frame of the slotter. This installation is desirable on large drills, but not on small ones, owing to the vibration.



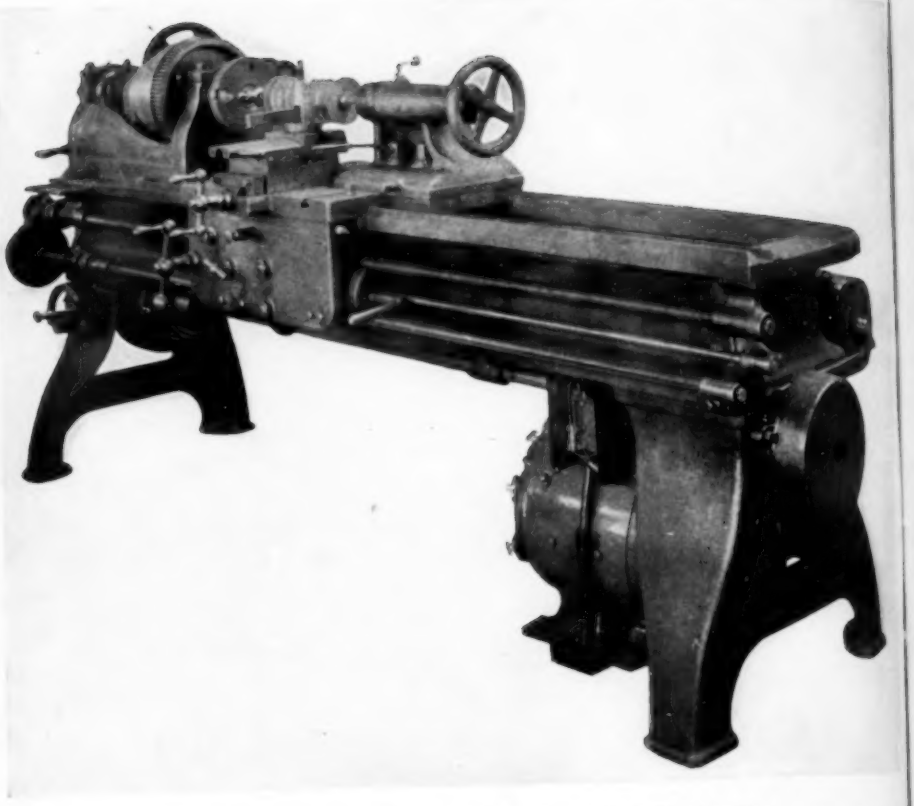
"WARNER & SWASEY" HORIZONTAL BORING MILL EQUIPPED WITH TYPE CK-4-214-500/1000-250 VOLT VARIABLE SPEED SHUNT WOUND, REVERSIBLE MOTOR, FIELD & MULTIPLE VOLTAGE CONTROL.
Showing altogether excellent installation. Note the compactness of the motor and all compliances.

"WARNER & SWASEY" HORIZONTAL BORING MILL EQUIPPED WITH TYPE CR-4-7½-500/1000-250 VOLT VARIABLE SPEED SHUNT WOUND, REVERSIBLE MOTOR, FIELD & MULTIPLE VOLTAGE CONTROL.
Showing altogether excellent installation. Note the compactness of the motor and all compliances.



26" REED LATHE DRIVEN BY CR-5-5 H. P.-500/1500-250 VOLT MOTOR.

Showing a raised installation of a motor on a 26" Reed lathe. The Wooden cross-piece shown by the arrow is used as a controller handle, enabling the workman to bend directly over his work and control at the same time. The feature is a good one.



18" REED LATHE DRIVEN BY CE-2-2 H. P.-1175-250 VOLT MOTOR.

Showing an excellent installation on an 18" lathe. This is the later development and improvement of the installation shown in the previous illustration of a 26" lathe. The motor installed under the machine admits of no vibration, takes up no space, and in a well-kept shop would be subject to but little trouble from dust. The controlling lever is shown on the apron, enabling the operator to control and watch his work at the same time.

the size is governed by the particular requirements of each machine and by the best practice existing at the time the installation is made. (The naval officer will, of course, use the Bureau's Specifications for Electrical Apparatus in connection with this part of the problem.)

39. The specifications having been sent out, it now becomes necessary to decide upon *how* the installation is to be effected, and to know the advantages under the particular conditions of installation of reducing the complication and the amount of auxiliary apparatus, and of installing motors of the simplest type possible.

40. This question is a very important and essentially a practical one, varying with each case and requiring as much engineering common sense as do the other parts of the problem. There are, however, certain general principles to be kept constantly in mind, and the most important of these are the following:

(1) The question must always be looked at from the point of view of the man who is to use the tool. From the operator's standpoint, ease of handling, simplicity of control, and safety are absolutely essential.

(2) The motor must be easily accessible, yet never in the way of the operator; usually under or at the side of the tool. Some vertical drills have motors at the top of the spindle (see photographs), and this is sometimes unavoidable. This is not a desirable installation, as the effect of vibration on the motor is very noticeable.

(3) Controlling apparatus must be placed so that the work can be watched and controlled at the same time. On a lathe, for example, particularly a large lathe, the controller handle should always be on the apron.

(4) As far as possible, avoid panels for switches and controlling apparatus. They take up useful room and cannot readily be shifted in case need arises to change position of the tool.

(5) Wiring should be carefully protected, usually with circular loom for flexibility.

(6) Controlling apparatus should be well protected.

41. With these ideas in mind, we can almost at once decide the relative worths of the various methods on installation. Some of the most representative of these methods are shown in the accompanying series of photographs collected by the writer.

SHIPS.

42. We come now to the use of motors on board ship. For a great many purposes it is not a question of whether we shall use motors or some other form of power transmission, it is simply a fact that an electric motor is the only thing that will do the work and so we cannot consider its advantages and disadvantages compared with other power transmitting devices. On a modern battleship electric motors are substituted wherever possible to do the work previously done by hand or by steam, and nearly every day sees advances made to extend its use still further. Certain it is that the limit of its use is not by any means yet reached.

43. The accompanying table, though not entirely up to date, shows the equipment of some of our battleships, from which at a glance some idea of the amount of power required, and the use to which it is put, may be obtained. In connection with the amount of power required, it is interesting to consider again the subject of alternating or direct current, and determine how this question is to be answered at the present time.

ALTERNATING CURRENT ON SHIPBOARD.

44. There are some officers who will be inclined to consider lightly what is intended as a serious consideration of this subject, who will say that A. C. may be all well enough on shore but on shipboard cannot be thought of for a moment. Strange as it may seem, this is not at all the case, and the more the question is looked into the more feasible does it become. At the present time it is not practicable to place A. C. on a ship, but the writer is of the opinion that as soon as a reliable mechanical speed regulator is invented a very large percentage of the difficulty will be removed.

45. Even at the present time it is quite practicable to use A. C. mains for lighting, chain ammunition hoists, blowers (where variable speed is not at all an absolute necessity), and even turret turning apparatus. This last may appear rather startling at first, but it is easily explained as follows:

46. There are three distinct systems of turret turning control now in use in the service: The Leonard system, the Cutler-Hammer system, and the Mechanical Speed Gear system. The Leonard system must have D. C. At the present time the power furnished to the turret is given through a separate generator or motor generator set for each turret, and the current in the mains

ELECTRIC EQUIPMENTS OF U. S. BATTLESHIPS UNDER CONSTRUCTION IN 1904.

	Tons Displacement.	Gen. Sets.	Turret Turning.	Boat Crane.	Deck Winches.	Chain Hoists.	Whip Hoists.	Ammunition Conveyor.	12" Amm. Hoists.	12" Elevating.	12" Rammers.	8" Amm. Hoists.	8" Elevating.	8" Rammers.	Ventilation.	Laundry.	Work Shop.
		kw.	hp.	hp.	hp.	hp.	hp.	hp.	hp.	hp.	hp.	hp.	hp.	hp.	hp.	hp.	hp.
U. S. S. Georgia.....	15000	2—100 6—50	4—35 4—15	5—35 3—20	6—30	21—2½	4—2½	....	4—30	4—6	4—7	8—11	8—3½	8—3½	From 30-40 making from 110 hp. to 120 hp.	1—6	1—10
" Nebraska....	"	2—100 6—50	4—35 4—15	5—35 3—20	6—30	21—2½	5—2½	....	4—30	4—5	4—7	8—11	8—3½	8—3½		1—6	1—10
" New Jersey..	"	2—100 6—50	4—35 4—15	2—50 4—30 2—20	6—30	21—3	5—3½	....	4—30	4—5	4—7	8—11	8—3½	8—3½		1—6	1—10
" Rhode Island	14600	2—100 6—50	4—35 4—15	2—50 4—30 2—20	6—30	21—3	5—3½	....	4—30	4—5	4—7	8—11	8—3½	8—3½		1—6	1—10
" Virginia.....	"	2—100 6—50	4—35 4—15	....	....	....	....	....	4—30	4—5	4—7	8—11	8—3½	8—3½		....	....
" Connecticut.	16000	8—100	4—35 8—15	2—50 2—30	....	26—3	6—3	4—4	4—30	....	4—7	8—11	8—3½	8—3½		1—8	....
" Louisiana....	"	8—100	4—25 8—15	2—50 2—30	6—30	26—3	6—3½	4—4	4—30	....	4—7	8—11	8—3½	8—3½		1—6	1—10
" Kansas.....	"	8—100	4—25 8—15	2—50 2—30	6—30	26—3	6—3½	4—4	4—30	....	4—7	8—11	8—3½	8—3½		1—6	1—10
" Minnesota...	"	8—100	4—25 8—15	2—50 2—30	6—30	26—3	....	4—4	4—30	....	4—7	8—11	8—3½	8—3½		1—6	1—10
" Vermont.....	"	8—100	4—25 8—15	2—50 2—30	6—30	21—3	6—3½	4—4	4—30	....	4—7	8—11	8—3½	8—3½		1—6	1—10
" Idaho	13000	8—100	4—25 8—15	2—35 2—25	6—30	16—3	5—3½	4—4	4—30	....	4—7	8—11	8—3½	8—3½		1—6	1—10
" Mississippi..	"	8—100	4—25 8—15	2—35 2—25	6—30	16—3	5—3½	....	4—30	....	4—7	8—11	8—3½	8—3½		1—6	1—10

supplying the motor is D. C., but the current in the case of the motor generator might just as well be A. C., and the only change necessary would be to supply an A. C. motor with the set instead of D. C. as is now done. The Cutler-Hammer system consists of one large and one small variable speed motor for each turret. This system presents greater difficulty than any others to the use of alternating current, but the writer can see no reason why, by the use of a motor generator set, this system could not just as well be run from A. C. mains. The Mechanical Speed Gear system is produced by means of a constantly running constant speed motor geared to the turret through a speed gear. Here, again, it is believed that an A. C. motor could just as well be used as a D. C. motor. But the points where the difficulties arise are in the question of boat cranes, ammunition car hoists, and perhaps also in the workshop where variable speed is required. Of course even here we could get D. C. out of our mains by the use of a motor-generator set for each crane or hoist, but this is not practicable and the thing needed, as above mentioned, is a mechanical speed regulator.

47. The advantages in using an A. C. motor on board ship are many. In the first place A. C. apparatus costs less, weighs less, and takes less space. A higher voltage could be used and so less transmission copper. There would be no commutators, no brushes, only a switch to throw for motors below 7½ horse-power, and the motor begins work. Repairs are much fewer and simpler, and motor is more "fool-proof" than D. C. apparatus. For these reasons, then, A. C. would be much better than D. C. on board a ship, but just as in the case of machine tools, what we want in a number of cases is variable speed, and this we cannot now get satisfactorily with an A. C. motor.

48. In regard to blower motors but little can be said. At present the specifications call for a 20 per cent speed variation, but there does not seem to be any very good reason for this, and induction motors with their constant speed and other advantages would then make an ideal blower installation.

WORKSHOP.

49. The remarks made on the application of motors on shore in the beginning of this paper apply equally well, of course, to the workshop of a ship. The machines used are small necessarily,

and need not be individually fitted with motors, as is done, however, on some of our very recent ships. The installation would be cheaper, almost as efficient, and weigh less, if one motor were used to run all the tools, as is now found to be the case on most of our ships in commission. Of course the advantages of the individual motor drive would not then be realized, but there is a decided question as to their relative importance on shipboard compared to increased weight, cost, and space required for installation.

AUXILIARY MACHINERY.

50. In the case of pumps and auxiliary machinery in general, motors are now replacing steam in many places, but as yet the "reform" has not extended to the engine room. It is well known that the pumps now in service in the engine rooms are very wasteful in their use of steam, and the efficiency and steam consumption of auxiliary machinery might be much improved by the use of motors. How to install these would be rather a difficult question, but it has been done with success. Boat cranes and deck winches are already motor driven. In the opinion of the writer, anchor engines will soon be in the same class so far as motive power is concerned. The advisability of installing motors for this purpose has already been suggested, one motor to be used for each bower chain, and to be so protected by circuit breakers or other safety devices as to eliminate any risk of their burning out or of disablement due to sudden or sustained overloads when breaking away the anchor. "The chief advantages to be gained by the use of motors are the elimination of the long, heavy, inefficient steam and exhaust leads to the present engine, and the possibility of controlling motor and windlass from the forecastle where the operator can be under direct control of the officer in charge of the operation."

INSTALLATION OF MOTORS ON SHIPBOARD.

51. But little can be said in a definite way as to how the installation on board ship is to be effected, as it is so essentially a practical question, varying with each case. In general, it is well to place motors where there is the least possible vibration and the best possible ventilation, the least danger from dust and sweepings, and where they are accessible for overhauling. If possible, resistance boxes should be placed where they will be well ventilated and yet

out of the way. Wiring should be protected as much as possible, either with piping, or with circular loom in case more flexibility is required than would be possible in the case of piping.

52. The question of protecting the wiring on shipboard is somewhat too large to discuss in this paper, particularly as the corresponding question in the shops has not been touched upon, but it might be mentioned in passing, that in the opinion of the writer, there is too much conduit installed on shipboard, and wiring could be made equally as efficient at a much less cost and at greatly reduced weight.

NOTE.—It is hoped that in the above paper the most important points affecting the efficiency and economy of the motor drive for use in the service have been brought out, and it is believed that the figures given therein are sufficiently conservative to be entirely reliable for use in practice.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NOTES ON THE SOLUTION OF THE TRIANGLE OF POSITION WITHOUT TRIGONOMETRICAL COMPUTATION.

By PROFESSOR GUISSEPPI PESCI, of the Italian Naval Academy.

(Translated from the *Rivista Marittima Italiana* by F. W. Morrison.)

1. The triangle of position may be solved without trigonometrical computation in three ways:

(a) By numerical tables.

(b) By abacuses.

(c) By geometrical instruments.

2. Attempts of the first sort are very numerous and may be classified in groups according to the problem to be solved. The most important groups are those dealing with the calculation of the altitude, that of the hour angle, and that of the azimuth.

As the number of such attempts is constantly increasing[1] we

[1] The most recent attempts at the calculation of the altitude are: That of *Ball* (Altitude Tables, London, 1908, Potter), and that of *Guyou* (*Nouvelle Méthode pour déterminer le point à la mer.* Comptes rendus, 1908, No. 21).

Ball's large table is one of three entries and gives the altitude directly (to tenths of a minute) with the latitude, hour angle and declination (these three elements to the nearest degree); in our opinion, however, they present two inconveniences: that of serving only for values of δ included between $-24°$ and $+24°$, and that of substituting for the position by dead reckoning an assumed position (in order to avoid interpolations of latitude and hour angle) whose distance from the former may be four times as great as *Souillagouët* thinks permissible. (Ball's 3d volume, δ and L to 60°, has now been published.—P. R. A.)

Guyou's new method also, although theoretically very attractive, does not seem to be without its drawbacks, from a practical point of view, since it requires the use of two double entry tables (one of which is the

believe it would be useful to publish critical comparative studies (such as we have already published)[2] of the various special tables belonging to each group.

Such studies would be extremely useful to those who desire to simplify, for a special reason, the solution of some fundamental problem, without a knowledge of the bibliography of the subject; indeed, in not a few cases, these studies would show that the problem they had set themselves was already solved or impossible of solution.

These studies would also prove valuable by showing, in the case of each group, what special tables are preferable. The advantage of such a knowledge might, perhaps, not be felt by such as have already become accustomed to some fixed method, *for it is the method already known that is usually held to be the*

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table of Lord Kelvin), and strict attention to the signs, because, for example, the auxiliary declination and also the auxiliary altitude may have signs contrary to those of the true declination and the true altitude.

But, in this connection, we may again be permitted to insist upon the conclusions at which we have already arrived in our papers *Sul calcolo relativo alle rette d'altezza* (*Riv. Marit.*, Jan., 1903, and April, 1904). It seems to us that all the methods, more or less indirect, proposed for the calculation of the altitude are generally unequal to the purpose, and that the simplest method is always that offered directly by trigonometry and based upon the use of Euler's formula transformed by prosthaphæresis (see Sec. 5 of the second of the above-cited papers), for which a table of natural cosines with one minute intervals and calculated to five places of decimals is more than sufficient; and it is with great pleasure that we have seen this our opinion shared by Lieut. Segrè (*Riv. Marit.*, appendix to the issue of March, 1909.)

Furthermore, we remember that the one who proposed (at the beginning of the last century) the use of natural values for all the principal nautical calculations, was Francisco de Paula Travassos; see his *Methodo de reducçâo das distancias observadas*. . . . . (Coimbra, Real Imprensa, 1805) to which is annexed a table of natural cosines only, which, having then to serve also for the calculation of lunar distances, is calculated for every 10″ and to six places of decimals.

[2] On Lord Kelvin's Tables for Facilitating Sumner's Method at Sea. (*Riv. Marit.*, Jan., 1909).

Since Dr. Pesci's article was written there have been published "Altitude and Azimuth Tables for Facilitating the Determination of Lines of Position and Geographical Position at Sea," by Lieutenant Radler de Aquino, Brazilian Navy. These tables were described by their author in the December, 1908, number of the U. S. NAVAL INSTITUTE PROCEEDINGS, and may be obtained from their publisher, J. D. Potter, 145 Minories, London (10s. 6d.), or from Messrs. John Bliss & Co., Front Street, New York.—P. R. A.

easiest and the quickest; it would be, nevertheless, most important for those beginning the study of nautical calculations.[3]

3. Critical comparative studies of the kind indicated should be made, chiefly, from two points of view: having regard to practicability and to the degree of approximation.

The practical value of tables depends upon the rapidity and facility with which they can be used.

For the purpose of rapidity a small table is frequently preferred to a large one, though we believe unadvisedly, for the former undoubtedly requires more time than the latter, on account of interpolations. There are, in fact, examples of this, such as the well-known traverse tables and those for calculating the tides.

As for facility of use, tables should have for their arguments of entry the data. Examples of this are the azimuth tables of *Bolte*[4] and *Fulst*.[5]

In both these methods a numerical value is first calculated by means of two special tables, and by means of this value, the azimuth is obtained from a third table; but in the third table of *Bolte*, the azimuth is an argument of entry, while in that of *Fulst* the azimuth is a value given by the table itself. For the above reason, *Fulst's* tables (which we believe could advantageously be made more extensive) are to be preferred to those of *Bolte*.

4. Finding the degree of approximation constitutes a problem of considerably more difficulty.

For tables of only one entry, formulæ are available (deduced from the theory of interpolations) that give, for the errors of interpolation, upper limits very close to the errors themselves.[6]

[3] "It is customary to cling to old ways, though it would be better to be somewhat more sceptical of their efficacy. If one is not sufficiently enlightened to abandon them, it would be advisable at least not to transmit them to one's pupils, to whom it is possible to show better ones." *Delambre*, History of Astronomy, Vol. I, p. 264.

[4] *Tavole azimutali.* Authorized translation by A. Vital. Trieste, Schimpff, 1900.

[5] *Azimut-Tafel.* Bremen, Heinsius Nachfolger, 1898.

[6] These formulæ applied to ordinary trigonometrical log. tables, give such narrow limits that they could never be made sensibly less (for ordinary purposes) whatever other method be followed in finding them. See our two articles: *Sulla recerca del logaritmo-seno e del logaritmo-tangente*

But for tables of double and triple entry, formulæ that can be deduced from *Taylor's* theorem are the only ones available up to the present time; and these give, generally, extreme limits too far from the errors under consideration; it is therefore impossible to get from them the criteria necessary for limiting the differences between the arguments of entry.

Hence it is necessary to consider only one of the arguments as variable, and then to study the errors of interpolation for each of the values assigned the other arguments: a laborious task, that might, however, be rendered less arduous by utilizing the principle of continuity. For example, in the group of tables giving the hour angle, those of *Davis*[7] are very well known. Now from these, for $\phi = 48° \ 30'$, $\delta = 0° \ 30'$, $h = 36° \ 30'$, we have P with an error greater than $8'$; while for $\phi = 49° \ 30'$, $\delta = -22° \ 30'$, $h = 16° \ 45'$, we have P with an error greater than $24'$. It is quite true that these cases are somewhat unfavorable, but where do these cases begin, and why are they not excluded?

5. In a recent and authoritative bibliography appearing in the *Rivista Marittima*[8] the question is asked whether it would not be advisable to construct a general table[9] for the solution of the triangle of position. Such a table, carefully planned in its arrangement and its limits, would do away with a great many special tables (an unquestionable advantage).

We believe it interesting, in this connection, to set down here a noteworthy statement of Lord Kelvin:[10]

> When we consider the thousands of triangles daily calculated on all the ships at sea, we might be led for a moment to imagine that every one has already been solved, and that each new calculation is merely a repetition of one already made; but this would be a prodigious error, for nothing short of accuracy to the nearest minute in the use of data would thoroughly suffice for practical purposes. Now there are 5400 minutes in 90°, and

degli archi piccoli; La Corrispondenza, 1901; *Periodico di Matematica*, 1901; *Sulle operazioni fra numeri decimali approsimati, Periodico di Matematica*, 1904.

[7] Chronometer Tables. London, Potter, 1899.

[8] By Doctor Alessio, on the Position Line Star Tables, of Goodwin (March, 1907).

[9] Thomson's Table, examined in our article cited in Sec. 2, may be considered as a general table for the solution of the spherical right triangle, but not for the *direct* solution of all spherical triangles.

[10] Proceedings of the Royal Society (of London), Vol. XXIX, 1870-71, p. 260. This statement is repeated, with a different wording, in *The Tables for Facilitating*, etc.

therefore there are 5400^3 or 157,464,000,000 triangles, to be solved for a single angle. This, at 1000 fresh triangles per day, would occupy about 400,000 years. Even with an artifice such as that to be described below, for utilizing solutions of triangles whose sides are integral numbers of degrees, the number to be solved (being 90^3, or 729,000) would be too great, and the tabulation of the solutions would be too complicated.

Three objections, however, may be made to this statement. First, it is not enough to assume that all three sides are less than 90 degrees, for where the latitude and the declination are of contrary name, the triangle has one side greater than 90 degrees, and its general solution cannot (without trigonometrical calculation) be reduced to the solution of a triangle with all three sides less than 90 degrees. The second objection is that in solving all the spherical triangles possible (given the three sides), it is not necessary to consider the permutations of these sides, as has evidently been done to obtain the above results. It is enough to consider the combinations, since in varying the order of data, a new calculation does not arise and it will suffice to make a corresponding variation in the order of the angles. The third objection is that before making useless calculations it would be determined *à priori* whether the conditions necessary for the existence of the triangle are satisfied.

We have, in view of these objections, made another investigation, and by a rather arduous process of reasoning, which we do not think necessary to record here,[11] we are able to show that the triangles to be solved are 26,258,581,800, if the sides are considered to vary by 1′: or 125,580 if the sides vary by 1°: in either case the triangles to be solved are less than one-sixth as many as those indicated by Thomson.

The first result has no practical importance, and serves merely to satisfy a purely scientific curiosity. This cannot be said, however, of the second, and contrary to the conclusion reached by Lord Kelvin (a conclusion based on a result six times greater than that found by us) we are of the opinion that a table in which the sides vary by whole degrees could easily be calculated and included in a single volume. We believe, too, that there could also be added to this table the three differences for 1′, given by *Davis,* which simplify considerably the interpolations. This general table would be of the utmost utility by doing away with many

[11] Un Problema d'analisi combinatorio. *Periodico di Matem.,* 1908, Vol. XXIII, fasc. IV.

special tables (chronometer tables, azimuth tables, etc.) used in nautical calculations. We repeat, however, that such a table should be most carefully planned as to its arrangements and limitations.

6. Coming to the second type (cf. Sec. I): Methods for the nomographical solution of special problems are numerous. We believe the most important to be:

Nomogram of the Sun's Azimuth, constructed by Professor *Molfino,* (*Annali Idrografici,* 1901), and by Lieutenant *Perret,* of the French Navy (Note sur quelques applications de la Nomographie, *Annales Hydrographiques,* 1904).

Abacus for the Calculation of Latitude by Circumeridian Altitudes, constructed by the author of this paper (*Riv. Marit.,* 1898); with a diagram 45 × 35 cm., the result is obtained with a more than sufficient approximation.

Nomogram for the Calculation of Corresponding Altitudes, constructed by Lieutenant Perret (Note sur la construction d'un nomogram. Paris, Librairie Chapelot, 1905). In our own article (Sul calcolo della retta d'altezza. *Riv. Marit.,* Jan., 1903) we alluded to the construction of this and other abacuses; we would now add that with an abacus closely resembling the one referred to, it would be possible to obtain Pagel's coefficient as a function of declination, altitude and hour angle.[12]

7. Numerous attempts have also been made at the general solution of a spherical triangle, the two most noteworthy of which are certainly those of D'Ocagne.[13] All of them, however, offer certain disadvantages for the calculations of nautical astronomy, as, for example, the requiring of almost impracticable dimensions for an approximation itself hardly adequate.

Abacuses have also been used for the solution of a spherical right triangle (to which, as we stated in our article on Lord Kelvin's tables, may be reduced the solution of any triangle whatsoever). Two of these abacuses have been constructed with the dimensions required for actual use.

[12] In our article, *Las Tablas gráficas de Luyando, Contribucion à la Historia de la Nomagraphia,* Annals of the Faculty of Sciences of Zaragoza, September, 1908, March, 1909, is to be found a catalogue of all the abacuses used in Navigation (known to us) up to March, 1906.

Pagel's co-efficient is the change of hour angle for a change of one minute of arc in the latitude.—P. R. A.

[13] *Traité de Nomographie,* Secs. 123 and 124. Paris, Gauthiers-Villars, 1899.

The first is that of Messrs. Favé and Rollet de L'Isle:[14] its dimensions are not practical (about a square meter), and it does not always give a sufficient degree of approximation, as we have demonstrated in our article, *Resoluçâo Nomographica do Triangolo de Posiçâo.*[15]

The second is that of Mr. G. W. Littlehales, hydrographic engineer in the United States, whose name was already well known to us.[16] This abacus[17] is based, not on any nomographical principle, but on a very ingenious artifice which we analyzed in the article already mentioned. This abacus has the serious defect of occupying an area of 14.60 m. (which could, however, be reduced to one-fourth), divided among 365 pages. The minor defects are these: it is not neatly designed, it is not easily legible, and it is expensive ($25.00 in Philadelphia).[18]

In short, an abacus for the solution of any spherical triangle,

[14] A model (36 cm. × 36 cm.) of this abacus was recently published by Prof. *Constan*, author of the well-known *Cours Elémentaire d'Astronomie et de Navigation*, under the title, *Tables graphiques d'azimut.* Saint-Brienc, Guyon, 1906.

[15] *Rivista Maritima Brazileira*, November and December, 1907, and February, 1908.

[16] See *Pilot Chart of the North Atlantic Ocean.* January, 1903.

[17] *Simplest Method of Navigation.* Philadelphia, Lippincott Co., 1903.

[18] We should add to these two diagrams that of Chauvenet: *Diagram for the Solution of the Spherical Triangle, according to Chauvenet*, recently edited by Dr. L. Kohlschutter, published by Dietrich Reimer, Berlin, 1905, as well as the Azimuth Diagram of Dr. Alessio, *Riv. Marit.*, supplement to the July number, 1908.

Chauvenet's Diagram consists of a stereographic projection placed on another like projection and revolving around a common center. This diagram, we must say, seems to us hardly practical (1) because its dimensions are too small (the degree of approximation attainable is little less than a degree), (2) because of the defacement of the transparent material on which the movable part is traced, which reduced still more the degree of approximation. In the copy examined by us the results are altered more than half by this defacement.

The diagram of Signor Alessio is a polar abacus (see Nomography, p. 119), which could be reconstructed from a Favé abacus by a simple graphic process (see Notes on Nomography, *Riv. Marit.*, August, 1889, Sec. 19). It consists of two scenographic projections, one meridian and the other polar, and placed one over the other. We believe that its construction would be simplified considerably by placing an equidistant meridian projection over a polar projection also equidistant, since the latter is

or any right triangle, which is at the same time practical and productive of a sufficient degree of approximation for the calculations of nautical astronomy, does not yet exist, and it is to be feared that, with our present state of knowledge, it is not possible to construct one.[19]

8. It now remains for us to consider the instruments.

In the applications of plain trigonometry the degree of approximation required is often greatly limited. Consequently it is easy to conceive an instrument, which, in the solution of plane triangles, might be useful in many cases, and there are well-known examples of this. But this would not apply to spherical trigonometry, where the cases are rare in which only a limited degree of approximation (for example 15′) is required.

In nautical astronomy the problems in which this occurs are almost exclusively confined to (1) finding an azimuth, (2) finding the name of an observed star, and (3) calculation of the times of rising, setting, and passage across the prime vertical.

For these few cases and analogous ones (such as those refer-

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simple and uniform in design and does not require numerical calculation. Over the latter may be traced (also without calculation) the other projection by using Table III of Souillagouët. But once the diagram is made, this consideration has no practical importance.

Coming to the use of the diagram itself, we, too, are of the opinion that it may be useful for problems in which an approximation of 15′ at most is required (see the following Sec. 8); it would be desirable, however, to have it reduced to one part, thereby making it less cumbersome and doing away with the necessity of transferring the alidade from one part to another. This, however, would be equivalent to considering all the elements as positive and reduced to the prime quadrant and the result would be, either two groups of rulers like those given in another connection by Dr. Alessio (pp. 58 and 69 of the article cited) or mirrors like those given in our article, on *The Tables*, etc., already cited. This, says the author (at the bottom of page 115), would constitute a greater disadvantage than those mentioned above.

[19] Nevertheless, in the second part of our article already quoted (Resolucão, etc.), we explained an experiment of our own in the construction of a general abacus: its construction is quite simple in that it consists of two abacuses, one lying on the other. This abacus might be made practical and capable of an approximation generally sufficient. One of the abacuses referred to has already been reproduced by *de Aquino, Nomograms for Deducing Altitude and Azimuth*, U. S. NAVAL INSTITUTE PROCEEDINGS, No. 126 (see also *Muir, Navigation and Compass Deviations*, published by the U. S. Naval Institute. Annapolis, Md., U. S. A. Price, $5.00, gold).

ring to orthodromic navigation), we have the well-known Navisphere of *Aved de Magnac*.[20]

A solution such as the above has also been suggested for ordinary problems, in which the degree of approximation must be greater;[21] we do not, however, find the proposition practical, principally because it requires that the triangle shall be most accurately traced upon a sphere, and then that there be made upon it very accurate readings.

Another instrument has been proposed for the solution of two of the fundamental cases (given three sides, and given two sides and the included angle) when an approximation of 20′ or 30′ is sufficient. This instrument is the Azimuthometer of Lieutenant *Segrè*.[22] With this instrument the trihedron (given the three faces) may be solved as indicated by descriptive geometry; moreover its author has ingeniously found a way of solving with this instrument the second of the two cases mentioned.

We will close this brief review by examining, somewhat more extensively, an instrument for the solution of spherical triangles invented more than a century ago by the engineer Jean Francisco Richer.[23]

The Academy of Sciences of Paris announced in 1790 a prize competition for essays on the following question: "To find a sure and accurate method for the reduction of the apparent distance of two celestial bodies to the true distance, requiring in practice only the simplest calculations within the reach of the great majority of navigators." But, "among the essays submitted there was not one that offered a sufficiently true and accurate solution of the problem," and the contest was postponed to the following year. "Inasmuch as most of the competitors were merely artisans who had done their best to invent instruments which would effect the necessary reduction, citizen Lagrange," fearing "lest they should make further efforts with no greater success, set about to discover some principle that would afford a basis for the construction of such instruments."

[20] Heath & Co.: L. Crayford, London.

[21] Prof. E. *Ippolito, Uso del globo celeste.* Rassegna Navale, 1894.

[22] *Per la rettifica della deviazione magnetica in mare. Riv. Marit.*, November, 1903.

[23] Supplément à la Trigonométrie sphérique et à la Navigation de Bezont, by François Callet. Paris, Didot, An. VI. (1798.)

As a result the distinguished mathematician demonstrated that Euler's equation

$$\cos a = \cos b \cos c + \sin b \sin c \cos \alpha$$

may be transformed into

$$4 \sin^2 \frac{a}{2} = \left(\sin \frac{b+c}{2} + \sin \frac{b-c}{2}\right)^2 + \left(\sin \frac{b+c}{2} - \sin \frac{b-c}{2}\right)^2 - 2\left(\sin \frac{b+c}{2} + \sin \frac{b-c}{2}\right)\left(\sin \frac{b+c}{2} - \sin \frac{b-c}{2}\right)\cos \alpha, \quad (21)$$

but this equation is merely Carnot's formula applied to a plane triangle having sides respectively equal to $\sin \frac{b+c}{2} + \sin \frac{b-c}{2}$ and $\sin \frac{b+c}{2} - \sin \frac{b-c}{2}$, the included angle equal to α and the opposite side equal to $2 \sin \frac{a}{2}$; it is therefore sufficient to imagine an instrument by which this triangle may be readily constructed, since, given the sides b and c and one of the two parts a or α, you have at once the other part. And, "*it appears that citizen Richer was the most impressed by this, for the instrument that won the prize in 1791 was one he constructed on this principle.*"

We shall explain briefly the construction of this instrument, named by its inventor the *Trigonometric Compass.* It should be noticed that the scales (which in the figure appended are not indicated), as well as the description, refers here, not only to the solution of the triangle of position, but to that of any spherical triangle.

10. This instrument is composed of two equal principal arms $ABB'A'$, $ACC''A''$ (see diagram appended) hinged at A, in each of which is dove-tailed a movable auxiliary arm, ED and FG respectively. In addition, hinged at B, at the end of the first principal arm, there is a third auxiliary arm BH, which by means of simple connections, always remains in contact with the end C of the second principal arm. Finally there is a fourth auxiliary arm OK, hinged at the end E of the auxiliary arm ED, the center O being a prolongation of the line BA.

Each of the two principal arms is graduated on the edge of the groove indicated in the diagram, according to the laws of sines (with their common length as a unit), commencing at AA' and AA'', but the divisions indicate twice the measure, instead of

the measure itself, of the corresponding arc. The two auxiliary arms ED and FG are graduated in the same manner, the first commencing at E, and the second at F; to the latter is attached an index L, which in a direction parallel to AA'' carries the origin 0° of its scale FG along the edge AC. Finally, the two arms OK and BH are also graduated, commencing at O and B, like the four preceding ones except that their divisions are twice as great.

From the above it is clear:

1st. If the graduation m of the arm AB coincides with the graduation n of the arm ED, the result is

$$AO = \sin \frac{m}{2} + \sin \frac{n}{2}.$$

2d. If the graduation m of the arm AC coincides with the graduation n of the arm FG, the result is

$$AL = \sin \frac{m}{2} - \sin \frac{n}{2}.$$

3d. If the graduation p of the arm OK coincides with the index L of the arm FG, the result is

$$OL = 2 \sin \frac{p}{2}.$$

4th. If the graduation q of the arm BH coincides with the extremity C of the arm $ACC''A''$, the result is

$$BC = 2 \sin \frac{q}{2};$$

but from the isosceles triangle BAC we get

$$BC = 2\, BA \sin \tfrac{1}{2} BAC,$$

wherefore, BA being equal to the unit of measure, the result is

$$q = BAC. \qquad (22)$$

SEC. II. We shall now show how this instrument is used in the two cases which interest us. To be specific we shall refer to the example: $b = 85°$, $c = 45°$, $a = 70°$, whence $\alpha = 72°\ 23'$; and the arrangement of the diagram corresponds exactly to this example.

Given the three sides a, b, c, let the graduations $b+c$ of the two principal arms coincide with the graduations $b-c$ of the two auxiliary arms DE, FG; then revolve the two arms $ACC''A''$ and OK until the index L coincides with the graduation a of the arm

OK: the point C will then mark on the scale of the arm BH, the value of a.

$$AO=\sin\frac{b+c}{2}+\sin\frac{b-c}{2};\ AL=\sin\frac{b+c}{2}-\sin\frac{b-c}{2};\ OL=2\sin\frac{a}{2};$$

hence, in the rectilinear triangle AOL, from (21), we get $BAC=a$, and this angle will be exactly the one determined by C on the scale of BH. To obtain β and γ it will suffice to permute the data.

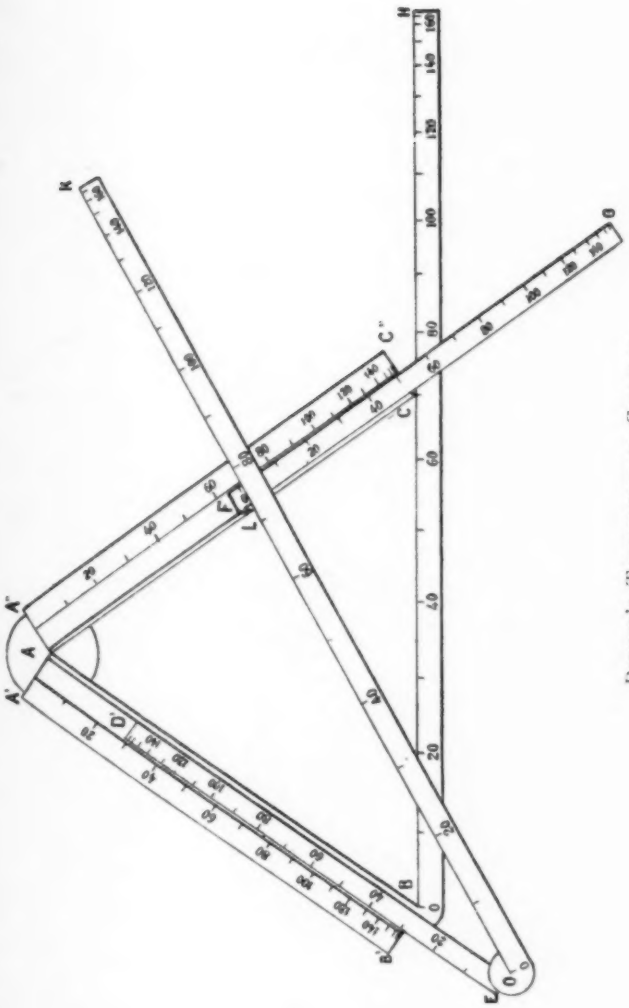
Given the two sides b, c, and the angle included a, let the two arms DE and FG be carried as in the preceding example to the extremity C to coincide with the point a of the scale BH, then revolve the arm OK until its graduated edge passes through the index L; this index, from what we have already seen, will determine on the scale of the arm OK the value of a. The angles β and γ can then be found as in the preceding case.

First Observation.—By considering the polar triangle, the instrument in question solves four of the six fundamental cases: then the doubtful cases are excluded; but the author of the pamphlet shows us that by starting with Napier's formulæ, it is sufficient, in order to solve even these two cases, to add to the instrument another scale, and to make use of an ordinary compass.

Second Observation.—The pamphlet we have been examining states that the degree of approximation obtainable with the trigonometric compass is five seconds (p. 9); that *Borda* conceived "a means of making the instrument just as exact as if its dimensions had been decupled" (p. 29); and the author of the same pamphlet adds, "the instrument interested me as much as if I had been the inventor of it" (p. 10).

The degree of approximation obtained in the numerical examples recorded is 10″; the dimensions of the instrument, however, are not mentioned anywhere in the article.

In any case we believe that this instrument deserves to be saved from oblivion. With the improvements made in the construction of geometrical instruments, it might, perhaps, become practically useful.



RICHER'S TRIGONOMETRIC COMPASS.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE CUTLER-HAMMER MANUFACTURING COMPANY'S DIFFERENTIAL SYSTEM OF TURRET TRAINING GEAR.

Prepared by COMMANDER W. H. G. BULLARD, U. S. Navy.

GENERAL DESCRIPTION.

The following general description of this method of turret turning has been prepared from data and information furnished by the manufacturers, the Cutler-Hammer Manufacturing Company.

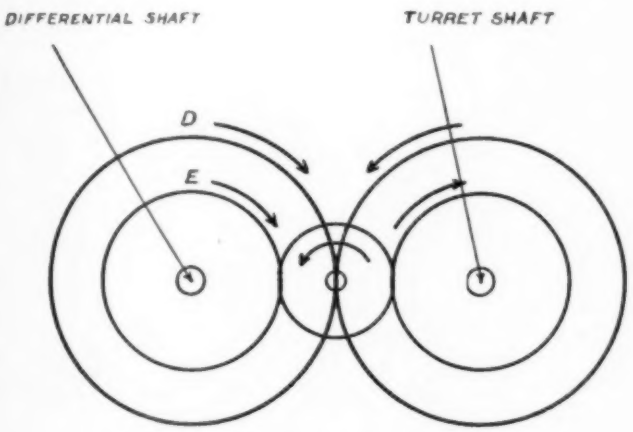


FIG. 1.—Method of Reversal of Turret Shaft.

The system consists of a differential set of spur gears entirely enclosed in an oil-tight casing, and operated in a grease bath. This grease bath cushions the noise and reduces the wear of the teeth to a minimum. The upper half of the differential gear case is made readily removable and is provided with a hand-hole for inspection and the insertion of grease.

The differential system is operated by two motors, one large and one small one, and each of variable speed. These motors always run in opposite directions and the direction of their rotation is not changed and they are so geared to the differential system of spur gears that the differential shaft always turns in one direction. This differential shaft turns the turret through the agency of a double magnetic clutch and two sets of gears connected to it and to the main turret shaft, one set driving the turret shaft direct, the other through an idler. This effects the reversal of rotation of the turret without change of rotation of the motors as indicated in Fig. 1.

The magnetic clutch, differential gear and reversing gears are mounted on a common bed plate and the motors separately mounted, the small one above the large and are connected to the flanges of the motor shafts in the differential case. A view of the gear which also shows the motor shaft flanges is shown in Fig. 2.

ELEMENTARY PRINCIPLE.

The elementary principle of the differential system is shown in Fig. 3.

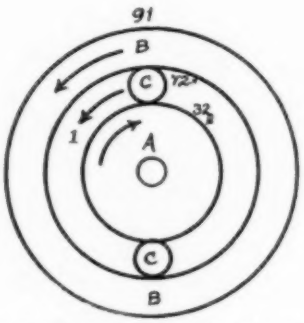


FIG. 3.—Showing Elementary Principle of Differential.

The gear *A* is driven by the small motor and gear *B* by the large one in opposite directions as indicated. The gears *CC* are connected to the main differential driving shaft and are also free to turn each around its own shaft. The revolution of *CC* and in consequence the revolution of the driving shaft will depend upon the relative speeds of *A* and *B*, and at one certain relative speed there will be no revolution about the center of the driving shaft, though each of the gears *CC* will rotate about its own shaft.

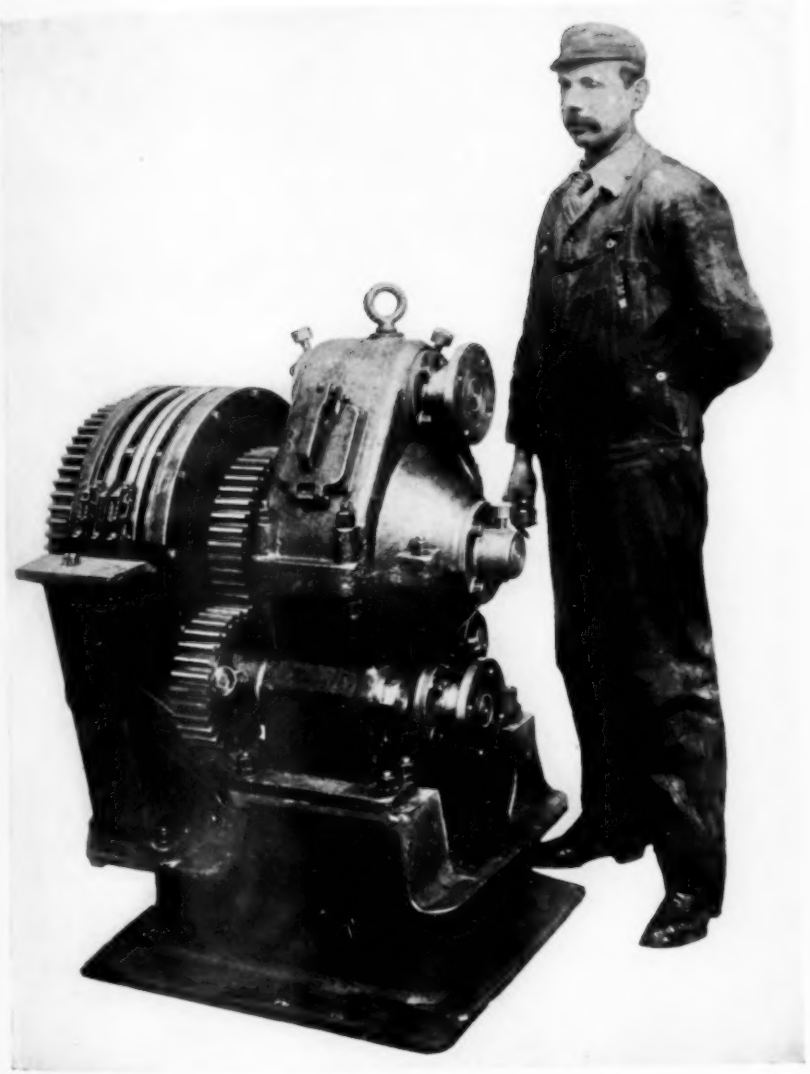


FIG. 2.—Differential, Clutch and Reversing Gears.

When this particular ratio of speeds does not exist, *CC* with its driving shaft will turn, the speed depending upon the relative speeds of *A* and *B*. Thus suppose gear *B* had 72 teeth, gear *A* 32 teeth, then when the relative speeds of *B* and *A* were as 4 to 9, there would be no motion of rotation of the driving shaft, the gears *CC* simply turning on their shafts. If the speed of *A* was lowered, *CC* would take a direction of rotation as shown by the arrow 1, its speed depending upon the ratio of speed of *B* to that of *A*.

The large motor always carries the turret load and the small motor acts as a speed regulating device and brake upon the differential and will usually be generating current instead of acting as a motor. The torque furnished by the large motor moves the differential shaft and consequently the turret by the braking effect of the small motor, or, in other words, the torque of the small motor tends to reverse the direction of the turret rotation. If the turret is locked and the differential shaft cannot move, the large motor drives the small one at a high speed and causes it to act as a generator. This is readily seen in the elementary figure. The small motor will always act as a generator when sufficient power is required in driving the turret to cause the large motor to drive the small one through the differential gearing. When the small machine generates current, it is thrown back upon the large motor and the current required from the power lines is approximately only the difference between that required by the large motor and the amount generated by the small one. If the small motor does not rotate, the large motor will drive the turret at a high speed.

Between the extremes of the turret being locked and no revolution of the small motor, or, in other words, under normal conditions, the large motor drives the turret at an intermediate speed, depending upon the torque required. When the small machine acts as a generator the torque required to drive it acts as a brake upon the differential and causes the turret to rotate, due to the difference in torque of the large and small motors. If the required torque is small, or the resistance to rotation is small, the friction of the gears is sufficient to furnish enough braking torque to turn the turret without the small machine acting as a generator; in which case it will then draw from the line only the small current necessary to practically rotate its armature idly. In case the turret load is entirely removed, the small machine would act as a motor entirely and help to overcome the friction of the gears.

MAGNETIC CLUTCH.

As has been stated, reversal of the turret is accomplished by a double magnetic clutch operating a set of reversing gears, and in the off position of the turret controller both sides of this clutch are de-energized, thus entirely disconnecting the driving gear from the main turret driving shaft although the motors and differential may be still operating at full speed. The clutch consists of a central body containing the two coils and is rigidly keyed

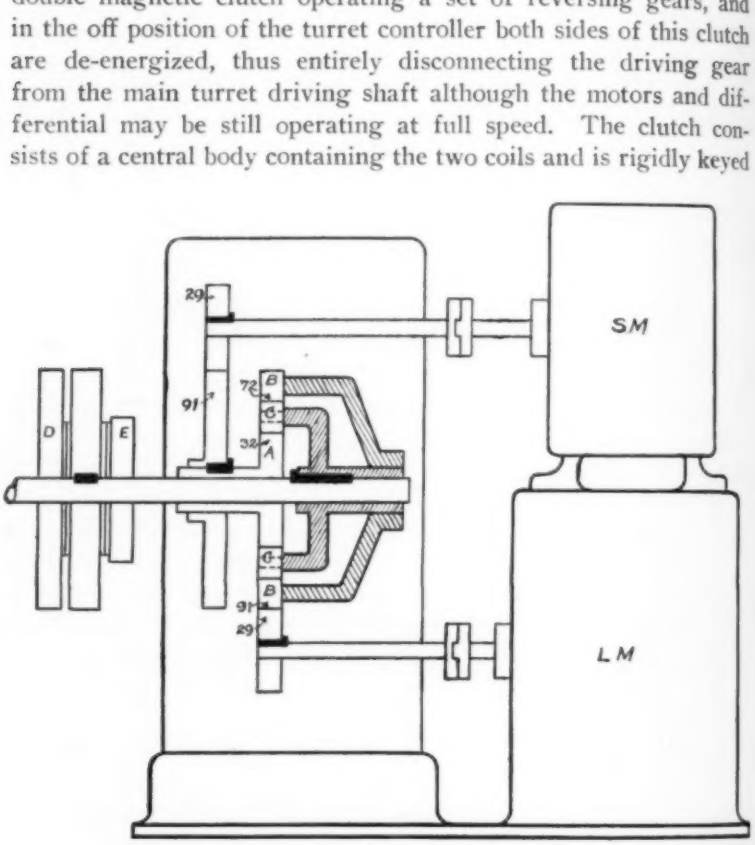


FIG. 4.—Details of Differential Gearing.

to the differential shaft. The armatures of the clutch are secured by cap screws to their gears which are fitted with bronze bushings and turn idly on the shaft when the coils are de-energized. The side thrust of the gears against the central portion of the clutch is taken up on bronze collars. When either one of the clutch coils is energized, its armature is attracted and held fast and the torque of the driving shaft is then transferred to the turret shaft through the corresponding gears, while the other gear and corresponding armature turns idly on the shaft.

The central portion of the clutch, its pole pieces and gears are of steel, as well as the discs holding the armatures to the gears, and the armatures themselves are cast iron to form a bearing surface against the steel poles. Three bronze collector rings are securely bolted to the central body and the pole pieces extend slightly beyond the surface of these rings and afford mechanical protection. A sheet metal casing extends over the whole clutch and prevents mechanical injury to the clutch or accidental short circuiting of the collector rings or brushes. The leads from the coils to the collector rings are made water-tight through the clutch casings.

MOTOR OPERATION.

The large motors, which, in the case of 12″ turrets are 25 H. P. and of the 8″ turrets 15 H. P. have a speed variation of about 2 to 1 by field control. The small motors for 12″ turrets are 10 H. P. and for 8″ turrets are 5 H. P. and they have a speed ratio of 3 to 1 by field control. The large motors operate from 400 to 800 R. P. M., the small motors from 300 to 900 R. P. M. The gearing within the differentials has approximately a ratio of 2¼ to 1, corresponding to the relative speeds of 400 and 900 R. P. M. This is seen from Fig. 4 where the details of the differential are shown in right-line form and where the driving gears of the large and small motors have respectively 72 and 32 teeth or a ratio of 9 to 4; these being in turn driven by other gears which have the same and equal ratio of 29 to 91 from each motor. Consequently, when the large motor is running at 400 R. P. M. and the small one at 900 R. P. M. there is no resultant motion of the differential shaft, which is the condition when the controller is in the off position.

The motor field leads are carried to the small master controller and the first movement of the controller strengthens the field of the small motor by cutting out a small section of resistance, reducing the speed of this motor slightly and causing the differential to be unbalanced and a very slow resultant motion of the differential shaft is produced. While the field of the small motor is being continually strengthened by cutting out resistance, the field of the large motor remains at its constant strength, and the small motor field is strengthened until the armature is running at about 300 R. P. M., the large one during the time the small one is changing from 900 to 300 R. P. M. running at about 400 R. P. M. At this time with the ordinary turret gearing from the main driving shaft,

the turret will be turning at about 25° per minute. Further rotation of the trainer's controller adds resistance to the field of the large motor, the small one at this time remaining constant, increasing its speed until it is operating at about 800 R. P. M., when the turret is then turning at its maximum speed of 100° per minute.

MASTER CONTROLLER.

The whole operation of starting the motors, of rotating the turret in either direction and varying the speed is accomplished by means of a small master controller in the turret. None of the armature leads are taken to this controller but only the motor field and clutch leads and a relay circuit from the motor starting boxes and those are all carried in a lead of small interior communication cable.

Each turret is equipped with two complete driving units, each unit consisting of the large and small motors, the differential gear, double magnetic clutch, reversing gears and an automatic starting box. Both driving units are controlled by the one small master or trainer's controller and either set may be put in operation by means of a starting and throw-over switch on the controller. In addition to starting and stopping the motors, varying their speeds and reversing the turret rotation, the master controller also effects the resetting of the circuit breakers after overload by the operation of a throw-over switch.

An open view of the controller is shown in Fig. 5 showing the throw-over switch on the left at the top of controller and the controlling hand wheel at the top through the center. The speed regulation is accomplished by means of connections made on the drum cylinder and by the insertion of resistance in the shunt fields of either motor as may be required.

This resistance is self-contained in separate compartments in the base of the controller, and is made readily accessible by removal of the cover around this portion of the controller. The resistance is of the unit type, and entirely enclosed, preventing the discharge of sparks in the possible event of a burn-out of the resistance. A small stationary commutator is installed in the controller for the purpose of making the various field connections to the unit resistances below. The segments on one side of the controller are cross connected to the segments on the opposite side, so that the same resistance is used when operating the turret in either direction. A

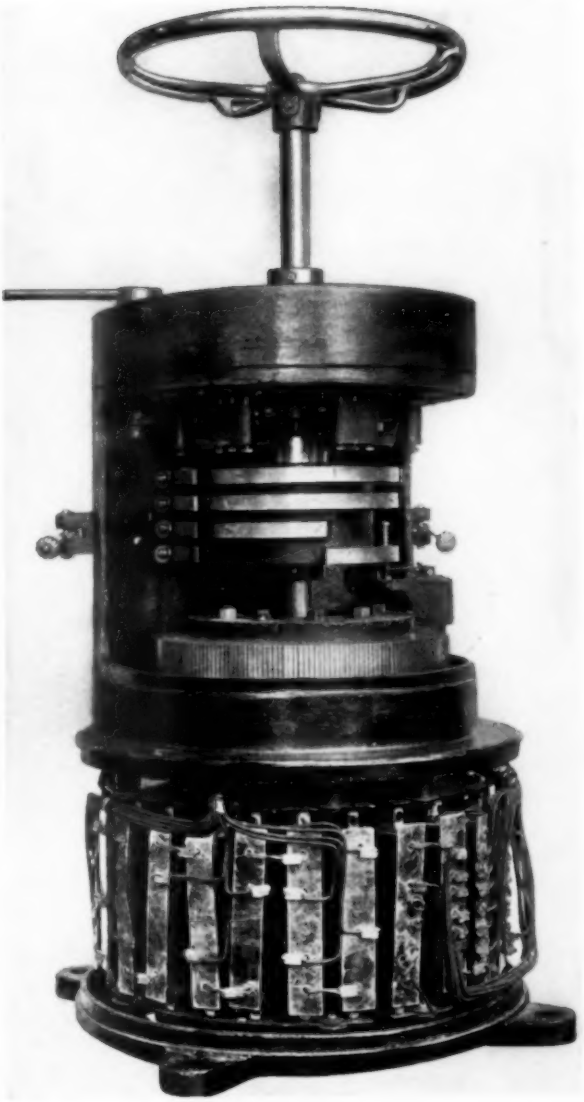


FIG. 5.—Open View of Controller.

small brush holder, carrying a carbon brush, bears on the commutator segments and is revolved by the drum cylinder. The controller is provided with a star wheel, having indents only at the off position and the first running position on either side. No other definite positions are provided and the carbon brush may be moved freely from the first to the last commutator segments, of which there are about 80.

The small auxiliary lever which operates the throw-over switch is mechanically interlocked with the main operating wheel so that it is impossible to throw this lever and start the motors with the operating wheel in any but the off position. In case of a blowing, of the circuit breakers, it is simply necessary to turn the operating wheel to the off position and throw the starting lever to its off position, which resets the circuit breaker and the equipment may then be again immediately started as before.

One revolution of the controller hand wheel gives the complete range of turret speeds from ¼° to 100° per minute in either direction of rotation.

The throw-over switch is in principle essentially a throw-over knife switch and corresponds to a double throw knife switch with six blades as shown in Fig. 7. Each arm of the throw-over switch corresponds to one blade and is insulated from the remaining arms.

In the central position of the throw-over switch lever both driving units are at rest, but as the lever is thrown to either side a corresponding driving unit is started and complete connections are made to the driving motors and starting panels; the other driving unit and panel being entirely inoperative.

THE STARTING BOXES.

The automatic motor starting boxes are furnished in watertight casings and contain the necessary apparatus for starting the motors from the trainer's controller and bringing them automatically up to their proper speeds and placing them in readiness to train the turret. They contain four electrically controlled switches or contactors which provide automatic starting and stopping of the motors from the trainer's station. A view of a starting box is shown in Fig. 6.

These boxes are also provided with an overload device causing

the contactors to open the circuit in case of overload and which may be reset from the trainer's controller.

Two of the contactors function as line switches and two as accelerators for cutting out the armature starting resistance which is mounted at the back of the panel. These two accelerators are equipped with relays called "individual series relays" which are set to drop their plungers at a predetermined amount of current, and as each plunger carries a disc for controlling the circuit to the solenoid of the next contactor, these relays regulate the time of cutting out the armature resistance and bringing the motors up to the required speed. This operation will be better understood when the wiring diagram is being considered.

WIRING DIAGRAM.

A complete diagrammatic wiring diagram is shown in Fig. 7, showing the wiring of the motors, motor fields, magnetic clutch, master controller, automatic starting box and the various leads connecting them. Only one unit is shown, the other being entirely similar in its operation.

The control wires connecting a panel to the drum controller are shown in a conduit and may be traced by the corresponding lettering of the wire given at the point where the wire enters and at the point where it leaves the conduit. For example, the wire at binding post E' enters the conduit and leaves the conduit at a point in the drum controller marked E'. Similarly the various connecting wires between the contact buttons on the reversing switch base and the drum fingers and wires leading to the starting panels are encased in a conduit within the drum controller. These leads may also be traced by the similar lettering.

METHOD OF OPERATION.

Starting the Motors.—To start the driving unit shown, it is necessary that the hand wheel of the controller should be in the off position, after which the throw-over switch is thrown in a clockwise direction. This movement connects the middle contact of each group with the clockwise outside contact button of that group. Thus P'' is connected to PP', CC to CC', FF to F', E to E', etc. This connects the leads of the unit shown and entirely disconnects all leads to the other unit which is rendered inoperative.

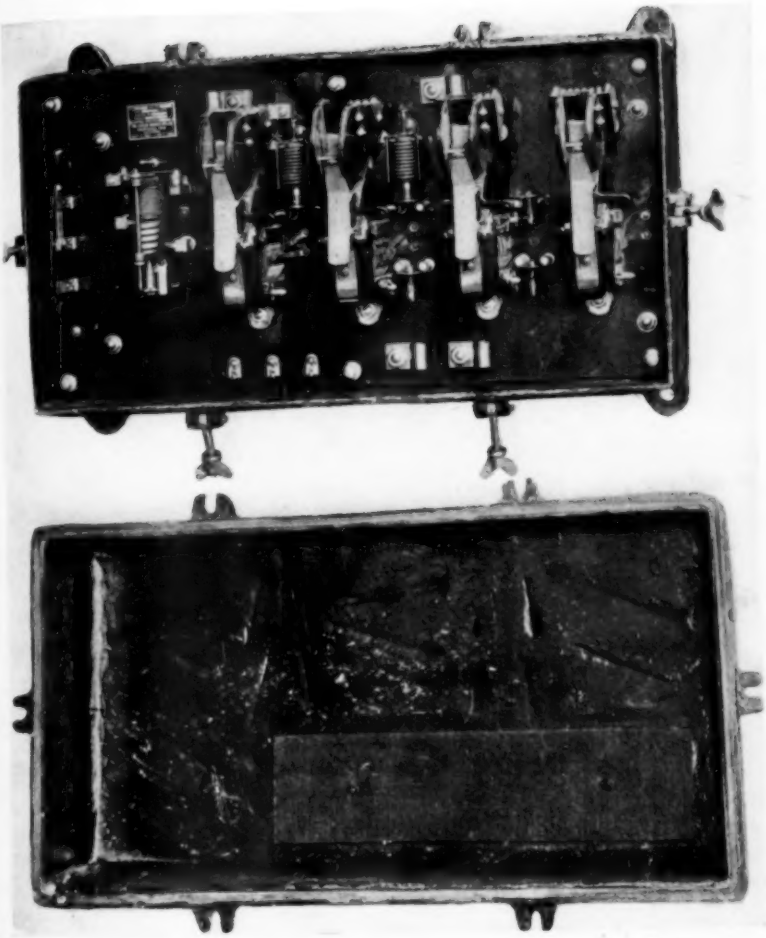


FIG. 6.—Interior of Starting Box.

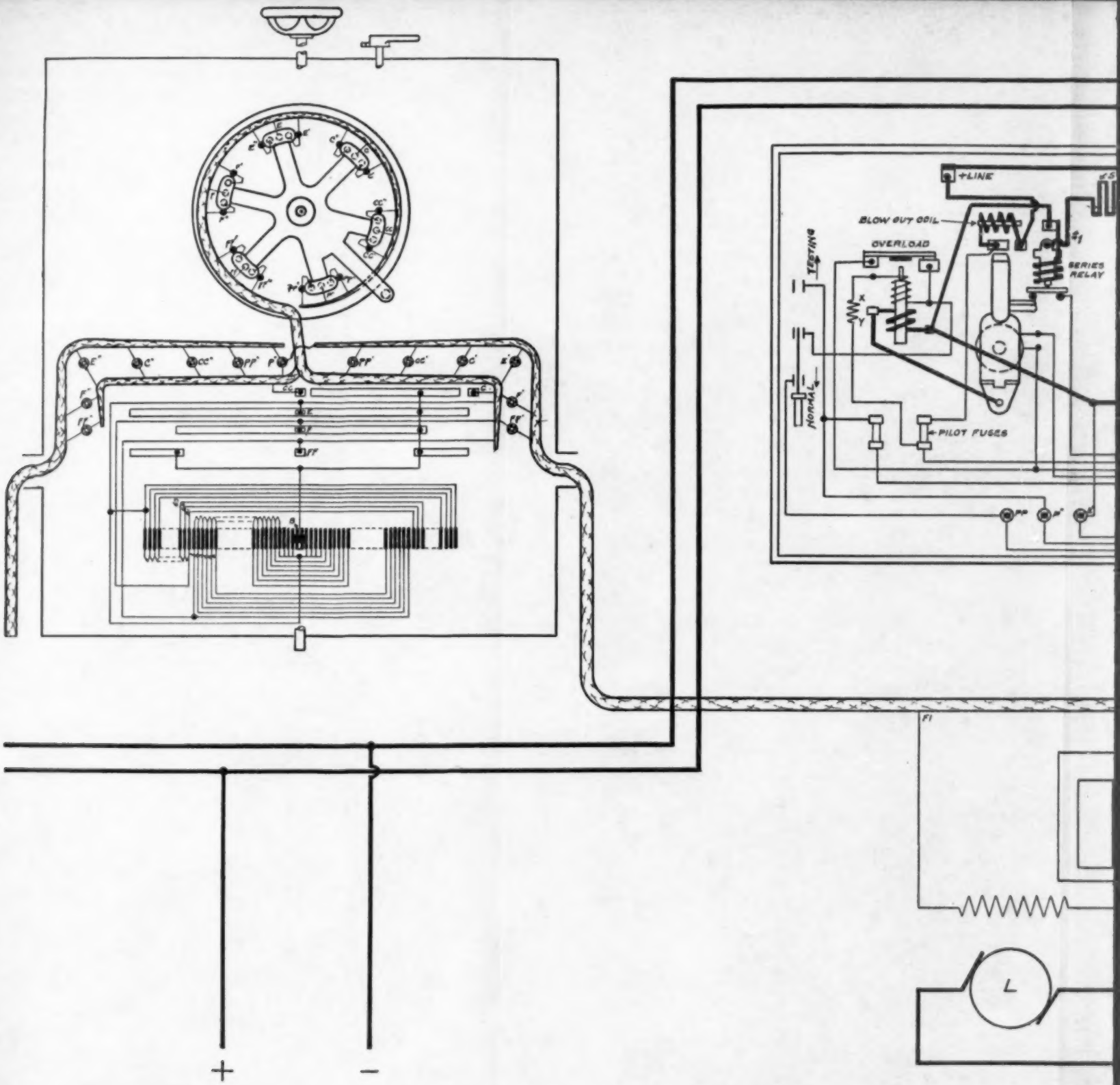


FIG. 7.—Diagrammatic Wiring Diagram.

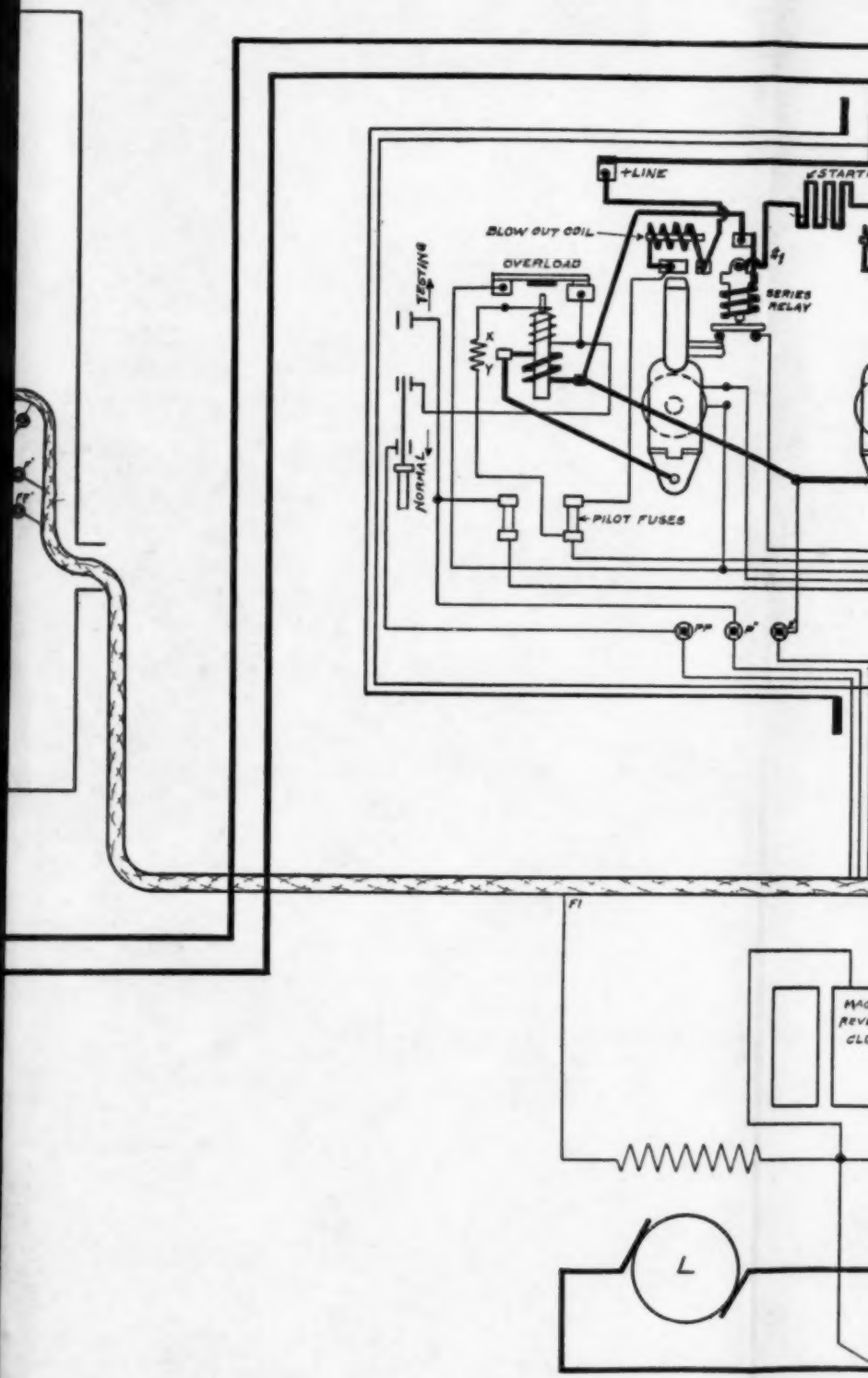
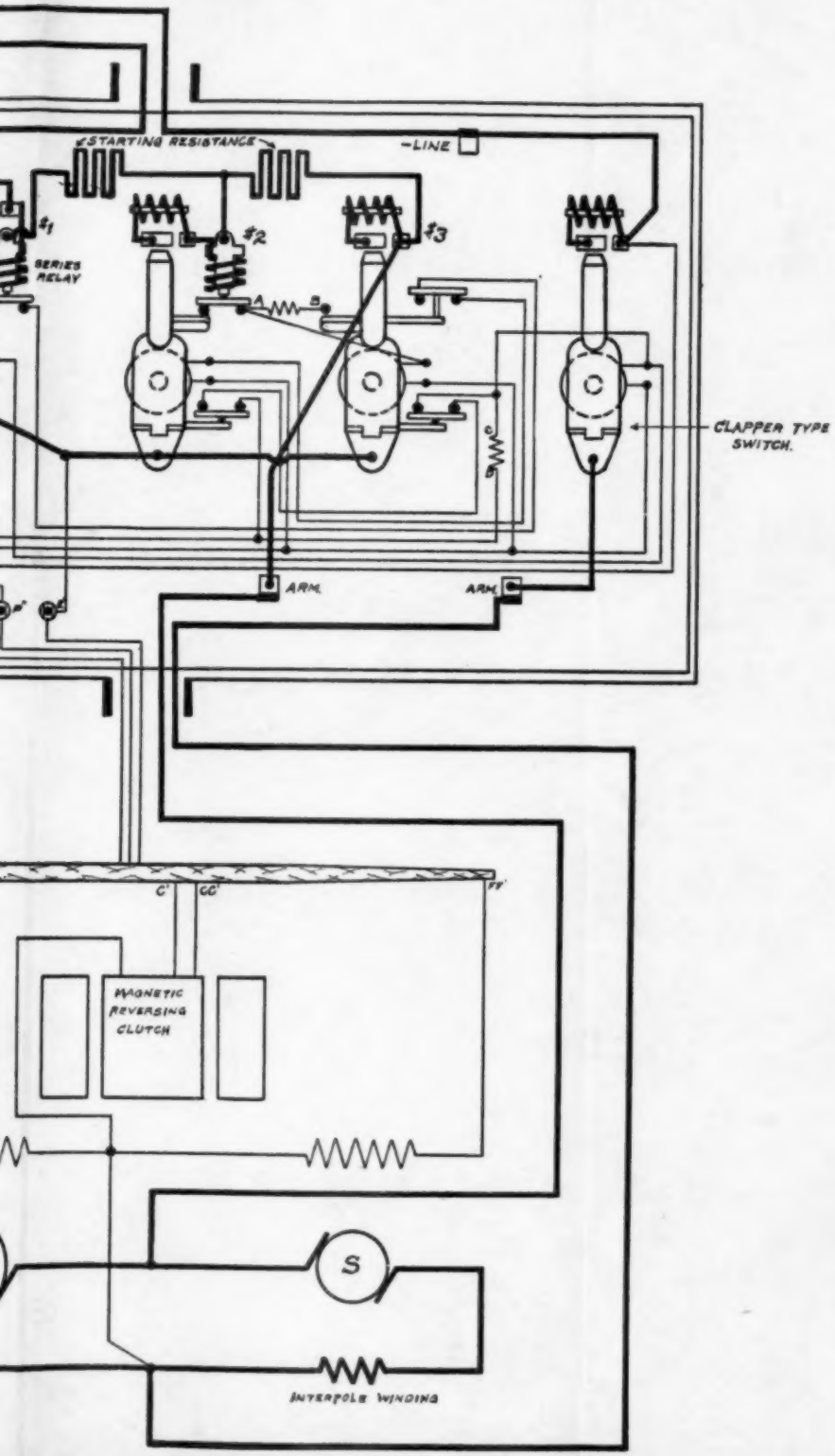


FIG. 7.—Diagrammatic Wiring Diagram.


STARTING RESISTANCE
-LINE
#1
#2
#3
SERIES RELAY
A
B
C
CLAPPER TYPE SWITCH.
ARM.
ARM.
C'
CC'
FF'
MAGNETIC REVERSING CLUTCH
S
INTERPOLE WINDING

The main power lines and leads to the motors, including resistances, relays, blow-out coils and overload coils are shown in heavy lines, while all auxiliary starting and controlling lines are shown in light lines.

Current from the main line comes to the terminal marked + line, through the blow-out coil of No. 1 clapper switch, then to and through the right-hand pilot fuse. Here the current divides; one part flows through the resistance *XY*, through the retaining coil of the overload magnet, through the single switch marked *normal* to the binding post *PP'* through the lead to the controller to the terminal in the drum marked *PP'* to the contact button *PP'* of the throw-over switch, to the center contact button *P''*, to the terminal marked *P''* in the controller drum, through the lead to the terminal *P''* in the starting box, through the left-hand pilot fuse, thence to the terminal on the blow-out coil of No. 4 clapper switch, to the terminal marked — line and then to the negative main lead.

This above described circuit energizes the retaining coil of the overload magnet.

The second circuit from the lower point of the right-hand pilot fuse is led to the right-hand contact post of the auxiliary disc contact on the second clapper switch, then through the contact disc to a similar post on the third clapper switch and from this post via the disc to the upper terminal of the fourth or right-hand clapper switch coil. This terminal is also connected to the upper terminal of the coil of No. 1 clapper switch. From these upper terminals current flows through the coils of No. 1 and No. 4 clapper switches to the common lead which connects to the overload and then follows the path described by the first circuit back to the negative lead.

These clapper switch coils, Nos. 1 and 4, are energized by full voltage and they close immediately. The closing of these switches places the two motors in circuit with all the starting resistance. Current flows from the positive line through the blow-out coil of No. 1 clapper switch, through the switch proper and then through the main overload coil. From this point the circuit divides, but as the second and third clapper switches are open, the current flows through the series relay No. 1, through all the starting resistances to the point marked No. 3, then to the terminal marked Arm, then to the common point between the two armatures where it divides through the two armatures, then from the common con-

necting point to the terminal marked Arm in the right-hand side of the panel, thence through No. 4 clapper switch and blow-out coil to the negative line. This completes the circuit and the motors start as the fields are energized at the same time as follows:

The instant clapper No. 1 closes, current flows to binding post E' on the panel to the binding post E' in the controller drum and then to contact button E' on the throw-over switch. From here current flows to the center contact button E which is connected to the drum contact finger E in the controller. Finger E is always in contact with the drum segment so that the entire drum cylinder is supplied with positive potential. The drum cylinder being in the off position as shown, finger F is in contact with the cylinder and consequently positive potential is fed through this finger to the contact button F', then to binding post F' in the drum and from there to the field terminal of the large motor F'. Current flows from here through the field of the large motor to the negative line through No. 4 clapper switch, and this field is energized with full potential.

The drum cylinder being of positive potential, the current, in addition to taking the circuit described above, flows to the commutator brush B which is mechanically and electrically connected to the drum cylinder, then through all the small motor resistance steps to finger FF in the controller, to center contact button FF on the throw-over switch, then to the contact button FF' and then to right-hand terminal FF' of the small motor field. Current then flows through the small motor field to the negative line through No. 4 clapper switch. This energizes the small motor field at the same time that the large motor field is energized, but it is supplied with reduced voltage while the large motor field has full potential.

Acceleration of the Motors.—The first rush of current through the series relay No. 1 causes it to lift immediately, raising the disc connecting the two contact posts. As the motor increases its speed, its counter electro-motive force increases causing the current to decrease and when it has decreased to a certain value, predetermined by the adjustment of the relay, the disc drops and makes contact between its two contact posts. When clapper switch No. 1 closes, it makes contact with the left-hand contact post of series relay No. 1, and current now flows from clapper switch No. 1 by way of the disc to the upper terminal of the switch coil of clapper switch No. 2, by way of the upper disc of clapper

switch No. 3. The lower terminal of the coil of clapper switch No. 2 is connected to the negative lead previously described, so current flows through the coil and clapper switch No. 2 closes. The closing of this switch short-circuits the first section of armature resistance, that between No. 1 and No. 2, since the armature current can now pass directly from the overload coil through clapper switch No. 2 and series relay No. 2 to the point marked No. 2, instead of flowing through relay No. 1 and the first step of armature starting resistance. The cutting out of this section of the armature resistance provides the motors with a second current inrush, which speeds up the motors and lifts relay No. 2. As the accelerating current decreases again to a certain predetermined value, relay No. 2 drops and current now flows from clapper switch No. 2, by way of the relay disc to the upper terminal of the coil of clapper switch No. 3. The lower terminal of this coil is connected to the line of negative potential, so current flows through the coil and clapper switch No. 3 closes. This cuts out the remaining section of armature resistance, since the current can now flow directly from the overload coil through clapper switch No. 3 to the motor armatures. This gives the armatures another rush of current and they come up to their full speeds as determined by their shunt field strengths.

Protective Circuits.—The closing of clapper switch No. 3 opens its upper auxiliary disc and so cuts off the positive lead from relay No. 1 to switch coil No. 2 which allows clapper switch No. 2 to open. The opening of this switch does not affect the main circuit as it is no longer carrying current and the power required to energize the coil is saved. The opening of switch No. 2 cuts off the positive lead to the third clapper switch coil by breaking contact with the left-hand contact post of relay No. 2, but the coil of switch No. 3 still retains current through the resistance *AB*, since switch No. 3 is of positive potential and makes contact with the contact post *B*. The current in the coil of switch No. 3 is reduced by means of the resistance *AB* and this serves to prevent the coil from overheating.

It must be remembered that the coils of clapper switches No. 1 and No. 4 obtained their positive feed through the lower auxiliary contact discs of switches Nos. 2 and 3, consequently when No. 2 closed, this circuit was broken and it was also broken when No. 3 closed. The coil of switches Nos. 1 and 4 are energized, however,

through the resistance *CD*, which is connected in parallel around the two auxiliary discs. This resistance reduces the current flowing through the coils of switches Nos. 1 and 4 and protects them from overheating. It will be noticed here that the motors could not have been started had either clapper switch No. 2 or No. 3 been closed for any reason when it was desired to start the motors, since switches Nos. 1 and 4 will not close on the reduced current flowing through the resistance *CD*. In other words, the switches will remain closed on a smaller current than that required to close them. This so-called interlocking circuit serves to protect the motors from undue current, such as would result if either switch No. 2 or No. 3 were closed previous to the line switches Nos. 1 and 4.

Overload.—In case of overload the small overload switch opens and cuts off the negative lead of all four switch coils and thus positively opens the clapper switches, which in turn opens the motor circuit. The retaining coil is still energized, though the main circuit is opened, and the overload plunger will remain in the tripped position until the retaining coil is de-energized. This is accomplished by moving the throw-over switch to the "off" position which breaks the negative lead of all the control circuits. When the retaining coil is de-energized the overload plunger drops and the overload switch is again closed. The motors may be then started by moving the throw-over switch lever to the "on" position, when the motors will start as previously described.

Testing Switch.—The throw-over knife switch on the panel is used in testing out from the panel, as it carries the negative feed to the four coils and to the retaining overload coil. The motors may be stopped or the overload reset by opening this knife switch, since it interrupts the feed circuit the same as opening the connection between the contact buttons *P″* and *PP′* on the throw-over on the switch base in the drum controller. By throwing the knife switch to the "testing" position, circuit is established direct from the negative line to the overload switch; that is, the circuit *P″, PP′* is by-passed and the motors started, irrespective of the motor controller. The shunt fields are energized even though the throw-over switch is in the "off" position, since the *E.F* and *FF* circuits are closed, due to permanent connections between the outside contact buttons of each group and the adjacent buttons. *E.E′* and *E″* are connected when the lever is in the "off" position, as also are *F.F′* and *F″*, etc.

The circuit breakers may be reset after overload by opening and again closing the knife switch, so that all the functions may be had by the knife switch control except the speed variation and the closing of the magnetic clutch circuits.

Speed Variations.—After having started up the motors by moving the throw-over switch to the "on" position, the hand wheel of the drum controller is moved in order to start the turret. If it is moved in such a direction as to cause the cylinder to make contact to drum contact finger *CC*, positive current is fed to finger *CC*, then to central contact button *CC''* of the throw-over switch, to button *CC'* and then to the terminal *CC'* of the magnetic clutch coil. The common terminals of the clutch coils are connected to the negative line and the clutch *CC'* is thus energized by full potential and power is transmitted to the turret. The large motor has full field strength and runs at its normal speed while the small motor has full weak field and runs at its maximum speed, and since the small motor tendency is to reverse the turret, the turret turns at a very slow speed.

As the hand wheel is turned still further, the commutator brush *B* moves over the commutator and gradually cuts out the small motor shunt resistance step by step, finger *FF* receiving positive current through the resistance steps 1, 2, 3, etc., which are gradually being cut out, since the brush is positive and is approaching step No. 1. This action decreases the small motor speed by increasing the field strength, the large motor speed remaining the same, which allows the turret to turn at increasingly higher speeds. When the brush has arrived at segment No. 1 all the small motor shunt field resistance is out of circuit and both motors are running at normal speed. Further movement of the hand wheel causes finger *FF* to make contact with the drum cylinder, thus feeding positive potential to the small motor shunt field. At this time, drum finger *F* rides off the drum cylinder, and receives its positive potential from segment No. 61, or through the large motor shunt field resistance steps Nos. 61, 62, 63, etc., as the brush rides over them and cuts resistance into the large motor shunt field. This gradually weakens the large motor shunt field and speeds up the motor, the small motor speed remaining the same, and this causes the turret to revolve still faster. This continues until all of the large motor field resistance is in circuit when the large motor will be running at its maximum speed, the small motor at its normal speed, and the turret will be turning at its maximum speed.

Reversing the hand wheel rotation reverses the cycle and the turret is turned at decreasing speeds until the "off" position of the drum cylinder is again reached, at which point the clutch coil *CC'* is de-energized and the turret stops, although the motors continue running. If the hand wheel is turned still further in the same direction, finger *C* will make contact with the drum cylinder and feed positive potential by way of the contact buttons *C* and *C'* through the conduit to clutch coil *C'*, which energizes that side of the clutch and connects power to the turret the same as before, except the train of gears has an idler inserted which reverses the direction of rotation.

The commutator segments are cross connected so that a further movement of the hand wheel produces the same functioning and speed variation, as when being turned in the opposite direction. It is thus seen that the turret is reversed by means of the hand wheel and that the complete range of speed variation is obtained in either direction by one turn of the hand wheel from one extreme position to the other.

It should be noted that both clutch coils are de-energized in the "off" position which has the effect of stopping the turret quickly and accurately. Permanent connections are made between the field resistances and the positive finger *E*, so that if for any reason the brush *B* was lifted from the commutator, the field circuits would not be opened.

The motors may be stopped by bringing the drum cylinder to the "off" position and then moving the throw-over switch lever to the "off" position, which movement opens the negative feed circuit *P*.

In order to start the other driving unit which is identical with the one described, it is only necessary to move the throw-over switch lever, so as turn the throw-over switch in a counter-clockwise direction. This causes a cycle of operations identical with that previously described.

CARE OF MAINTENANCE.

The differential casing should be kept approximately half full of grease for the lubrication and the cushioning of the differential gears. The several grease cups in the various bearings should be kept filled also with grease, although in most cases, one filling of the grease cups will furnish sufficient lubrication for a long period.

The clutch rings and brush holder should be examined occasionally, and the space between the clutch rings kept free from dirt, chips, etc. At long periods the carbon brushes bearing on the clutch rings will require renewal.

Occasionally the covers should be removed from the automatic starting boxes and inspection made of all contacts, especially the disc contacts, to see that they are clean and that the parts make proper contact in operation. The auxiliary contacts on the contactors require renewal at very infrequent periods.

The master controller, which is the essential feature of both driving units, should receive care and attention and the commutator especially inspected at regular intervals to see that the contact between the carbon brush and commutator bars is good and that there is no danger of grounding between commutator segments, owing to the collection of dirt, etc. Accumulation of moisture or dirt upon this commutator may cause grounding between segments and tend to eat out the insulating mica between segments. In the case of the possible burn-out of a resistance unit, the same may be removed from the controller and spare unit inserted without disturbing adjacent units. In inserting new resistance, special care should be taken to see that the proper amount of resistance is in circuit, as the proper operation of the system depends upon the required amount of resistance in circuit on a given controller position. If, for example, a unit was removed and a new resistance unit of higher ohmic value inserted in the field of the small motor, it would tend to produce too high a speed of the small motor, which would unbalance the differential in the wrong direction, and tend to make the small motor instead of the large one drive the turret; a thing to be avoided. If too much resistance is inserted in the field of the large motor, it will require the motor to drive the turret on the last controller position at a speed greater than 100° a minute and weakening its field to this point may tend to produce poor commutation.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE U. S. NAVAL WAR COLLEGE.

By REAR-ADMIRAL STEPHEN B. LUCE, U. S. Navy.

The proposition to erect the institution now known as the Naval War College was not received with favor by the naval profession. It was said to be chimerical, impracticable, and wholly uncalled for. Moreover there was no precedent for such a thing to be found in history. And yet there was an undefined feeling in the navy that in the matter of education there was something wanting. The daily routine of man-of-war life was, after the novelty had worn off, not very inspiring, and to many that seemed all the profession had to offer. "Is this all?" it was asked. Is this the sole fruit of four years' hard study at the Naval Academy? Each one was left to answer that question for himself. Each graduate of the Academy was left to his own devices, to continue his studies or not as he thought proper. It was soon found that in the naval profession, as in other walks of life, there is a specific gravity of mind as of matter. Young officers of intellect and love of their profession were quick to specialize in one branch or another of their calling and thus rise above the dead level of mediocrity. To the Bureau of Ordnance is due great credit for encouraging officers to take up the study of that branch, and the service has derived much benefit from such a wise policy. Others took up navigation or hydrography. Still there was something wanted. Numbers of officers of marked ability, having no taste for the subjects named, were feeling about blindly if haply they might find a wider field for their activities in scientific research. This feeling found expression in 1882 when a number of officers went to the Smithsonian Institute, Washington, D. C., and took up various scientific subjects. One studied ichthyology; another mineralogy, and accompanied the Geological Survey to Nevada and subsequently took up the study of fossil botany; another

studied mineralogy, and went on a geological expedition to Montana; another took up geology and went to Montana; another ethnology and went on an ethnological expedition to Arizona and still another took up marine invertebrates. Professor Baird, the head of the Institute, spoke highly of the proficiency of these young officers in the several branches of their choice. But no one of that day, as far as known, ventured to explain how these various studies, valuable as they were of themselves, prepared the young officer for the higher branches of his profession. That there were higher branches seems to have been but dimly perceived by the profession itself.

The most striking example of the misconception of the nature of the naval service, by the members themselves, is to be found in the Prize Essay of 1879 published in the Naval Institute. The author was a good representative officer of his class and had taken a single number on graduating from the Naval Academy. His treatise on naval education brought out the fact that he did not comprehend the true character of his own profession. The essay owes its importance, not to the fact that it was awarded the prize, though that itself was significant, but that, in a general way, it reflected the prevailing thought of the naval service. Higher education in the several branches of the profession was advocated on all sides; but the objective of the navy, as a whole, did not enter into their calculations. It seems not to have occurred to them that the sole reason a navy has for its existence is to prevent war; or, if needs must be, to engage in war; and if unhappily war, then to prosecute it with all the ability and resourcefulness and vigor the country can command in order that its horror may be short-lived. While urging advanced courses in the higher mathematics, in the science of ordnance, nautical astronomy and the rest of it, they overlooked their own science—the science of war. In advocating the cultivation of the arts of gunnery and navigation, mechanical engineering, and the mechanic arts generally, they took no account of their own special art—the art of war. It was obvious that the time had arrived when all the Naval Academy stands for, the foundation of a great and noble career, should be made manifest, not to the naval service alone, but to the whole country. Hence the proposition for a place where officers might have the opportunity of studying the science and art of war and the laws of war as laid down by the accepted authorities on marine international law.

These are great and comprehensive subjects, the mastery of which taxes man's highest intellectual powers. Since history began the great masters of the art of war can be counted on one's fingers. True, great admirals have appeared on the world's broad field of battle without the aid of a war college: nor can war colleges insure the production of great admirals. The truth of these platitudes, uttered as they have been with all the gravity of a Delphian Oracle, is freely admitted. But it is undeniable that such institutions are of greatest benefit to those who avail themselves of the advantages they offer. It is of little moment how much an officer may know, if only, by some mental process of his own, or by some natural or acquired gift, he comes to discern the true principles of the science of war. The war college is a means to that end. It will enable an officer to make the fewest mistakes in war—and that is all that can be claimed for it. But that "all" is much. His whole life then becomes one school. He then attains the highest ideal of education—"in peace a statesman, in war a militant seaman—in all times, on all occasions, acute to judge, and resolute to act. *

Naval and military histories show that opposing armies, or fleets, rarely meet on equal terms. At Trafalgar the *morale* of the allied fleet was greatly inferior to that of Nelson's command; and Rojesvensky's fleet was whipped before it left the Baltic. "Greatness" in a military or naval sense is a comparative term. A "great captain" is one who by force of intellect and resourcefulness—a knowledge of his business, in fact—has been enabled, by his combinations, to overcome an apparently formidable opponent, but one who, for one reason or another, proves unequal to the occasion. Of all causes leading to defeat, ignorance of one's own profession is the least excusable; hence the war college, to repeat it. The proficiency of Nelson in the art of naval warfare was simply the proficiency a man of vigorous intellect acquires in an art to which he applies his mind with diligence.

The plan for the higher education of naval officers, when unfolded to the chiefs of the line bureaus of the Navy Department, was coldly received. And no wonder. Their lines of thought lay in a different direction. The very qualities that had fitted them so well for their respective offices, had not prepared them to enter, with any degree of zest, an entirely new field of investigation. But the Secretary of the Navy, the Hon. Wm. E. Chandler, free

* Bulwer's Athens.

from the trammels of naval traditions, and with an intelligent appreciation of all that makes for the betterment of the naval service, was readily open to conviction. He at once ordered a boarl to investigate, and report on the proposed plan. On the receipt of the favorable report, he lost no time in issuing General Order No. 325 of October 6, 1884, establishing "a college for an advanced course of professional study for naval officers."* In his letter of February 11, 1885, to the Senate, the Secretary of the Navy stated among other things that "the college is intended to complete the curriculum (naval) by adding, to an extent never heretofore undertaken, the study of naval warfare and international law and their cognate branches (Senate Ex. Doc. No. 68—48th Congress, 2d Sess.). It is clear from the tenor of the Secretary's letter that the war college was not intended to furnish a "post-graduate" course, as that term is generally understood; but to throw open to officers of mature years the most comprehensive course possible of professional study.

By the order establishing the college, it was put under the Bureau of Navigation and the old Poor House on Coaster's Harbor Island, Newport, R. I., was assigned to its use. It will be recalled that at the time referred to the idea of stripping the American man-of-warsman of all the characteristics of a sailor had not then obsessed the "Young Navy." The training service was entirely afloat where it was intended to be kept, while the war college work was entirely on shore; hence there was not the slightest danger of the one interfering with the other by putting the college on the island.

The first college term, under Commodore S. B. Luce, U. S. N., as president, opened September 3, 1885, with a class of eight officers and closed September 30 of the same year.

The Secretary of the Navy, the Hon. Wm. C. Whitney, in his annual report of November 30, 1885, wrote "The Naval War College began its first session September 3." The instruction consisted of lectures on military science, the art of naval warfare and marine international law. The college now fairly in operation, by giving officers an advanced course of instruction on subjects directly connected with the most important duties of the profession, fills what has hitherto been a serious want in our system of naval education."

* The report of the board, dated June 13, 1884, will be found in the annual report of the Secretary of the Navy for the year 1885, Vol. I, pp. 98-103.

In his annual report of October 19, 1885, the Chief of Bureau of Navigation (Captain John G. Walker, U. S. N.) wrote: "The first session of the Naval War College opened September 3. In the course just ended a successful beginning has been made of this highly important work. . . . . Owing to the short time for preparation, etc., the course of instruction was not as complete as it is hoped ultimately to make it; but enough has been done to assure the final success of the institution . . . . and it can but commend itself to the earnest and hearty support of the Department and of Congress." This was certainly very encouraging.

In the annual report of the Secretary of the Navy of December 1, 1886, Congress was informed that the second session of the Naval War College, now in charge of Captain A. T. Mahan, was attendel with most satisfactory results. It is to be noticed that the college represents the first systematic attempt that has been made in the navy to give officers a higher training in the art of war which is the end and aim of their profession" . . . . "A striking feature of the program consisted in parallel courses upon the science of coast defense conducted by Commander Goodrich of the navy, and Captain Bixby of the engineer corps of the army, thus securing a presentation of the subject from its two essential standpoints." . . . . "The importance of the work to be done by the college can be hardly overestimated."

The annual report of the Bureau of Navigation of November 9, 1886, is of the same commendatory character, concluding with the remark that "the Naval War College may now be said to be fairly established and I beg to commend it to the earnest support of the Department."

The friends of the college felt greatly elated by this official commendation, and became more assiduous than ever (were that possible), for the continued success of the undertaking.

Third term—1887. In the annual report of the Secretary of the Navy of December 6, 1887, there is no allusion to the war college. This was ominous. But the Chief of the Bureau of Navigation under date of October 25, 1887, reported that "the third term of the college opened September 5, with a class of 22 officers of the navy and marine corps, and will close December 22 next." "The course was opened with a lecture by Commander Sampson . . . . relative to the objects for which the college was established and the necessity for its existence." "A list of the subjects treated by

the several officers, who will lecture during the term, will be found in the program . . . . *all of which treat very closely on the art of war.*"

In the third annual report of the president of the college, Captain Mahan, it is stated that the course of lectures of the past two years have been materially developed; subjects already treated have been enlarged, and recent and much new matter introduced, all bearing upon the practical question of carrying on naval warfare to the best advantage. This exhibits a healthy growth. The report goes on to say: "It is proper to remark that this matter, the art of naval war, has never received systematic treatment, and, so far as known, amid all the immense activity now bestowed upon the development of the *materiel* of war, nowhere in the world is there an organized attempt being made to effect such treatment except at the Naval War College." .... "It is as yet the singular position of the college among educational institutions that its has first of all to collect, digest, and arrange in suitable form for instruction the branches which it has to teach." . . . . "This deficiency, which so clogs the movement of the college is among the strongest arguments for its establishment, except with those who are ready to maintain that naval men do not need to study methodically the higher branches of their business." Reference is then made to the presence in port of the North Atlantic Squadron and the practical exercises of the college class in connection therewith, adding: "Thus that squadron will co-operate with the ends of the college in accordance with the original plan, and it may be believed to the benefit of the officers of the fleet and of the class." Appended to the report is a list of 146 lectures by specialists all intimately connected with naval operations and naval warfare.

In 1888 the Hon. Secretary of the Navy reported through the President to Congress: "The Naval War College now in its fifth year has done good work in furnishing, in the shape of lectures on technical subjects, the results of the close application of specialists having access to all of the best means of information to officers of the navy who, for various reasons, have not been able to keep pace with the advance of naval war." It is earnestly recommended that *whatever changes may be made in the administration of the college* nothing may be done to interrupt the attainment of its main object, namely, the systematic study by naval officers of the practice and methods of modern war applied to the special

necessities of the United States." In the words we have italicized is an unmistakable sign of imminent danger. It is the headsman deprecating the impending stroke.

The strongest endorsement the college had received, up to this date, is to be found in the annual report of the Chief of Bureau of Navigation of October 25, 1888: "The fourth annual session of the Naval War College," he writes, "opened 6th of August. The program as reported by the president of the college shows a continued improvement and extension of the course of study." . . . . The program shows that the course at the college has been strictly confined to the purposes for which the institution was intended and is at the same time comprehensive and searching within its proper scope. The subjects treated are of the first importance to the naval profession. . . . . Much credit must be accorded to the officers who have voluntarily . . . . given their time and labor to the preparation of lectures for the college." "Their efforts have not been without important fruit; for the institution whose novel plan and method in the beginning awakened sharp professional criticism has steadily grown in favor, and now counts among its ardent supporters not only all the officers who have followed its courses, but it is believed the great majority of the service generally, which recognizes in the college the instrument for supplying a long-felt want . . . ," and more to the same end. The entire passage of this just and appreciative characterization of the college is worth reading in the light of subsequent events.

The fourth term of the college had not yet begun when the president of the college received from the Navy Department, the following order:

NAVY DEPARTMENT, WASHINGTON, August 1, 1888.

Capt. A. T. Mahan, U. S. Navy, Naval War College, Newport, R. I.

SIR: In view of the great scarcity of officers for active duty, the Department requests that the course of the war college be limited to three months, beginning August 6. The order will be issued with such limitations. In view of the fact that during the last year's course less than an average of two lectures per day were delivered, excluding Saturday and Sunday, the Department feels that the interest attached to the course will not be impaired by condensing the course into a shorter period.

Very respectfully,

(Signed) W. C. WHITNEY,
Secretary of the Navy.

With this was given to the press the following:

Memorandum.

The amendment to the naval appropriation act, inserted in the Senate, directing the Secretary to consolidate the War College and Torpedo School, is in the interests of both these institutions. The Torpedo School grew up first as a school for the education of officers supplemental to the Naval Academy. Line officers found themselves ignorant of the new things. Torpedoes and mines and electricity aboard ship, all were new. Classes were made up yearly from the naval officers and sent there for instructions in these and kindred subjects. Then the new college started, where courses of lectures were delivered on miscellaneous subjects, again covering instructions supplemental to that of the Naval Academy. A channel less than half a mile wide flows between these two institutions, and Congress is asked to provide for each separate and distinct educational institution for line officers, making three altogether: The Naval Academy, the Torpedo School and the War College. The officers instructing, and those receiving instruction, are all ordered and given shore duty by the department. The bill provides that two of these shall be consolidated. I have favored the war college in each of my annual reports, but I do not deem the present arrangement wise or sensible and I have not seen any other person understanding the matter who does. (See *Army and Navy Register,* August 11, 1888.)

This order was like "a bolt out of the blue." It cut off, at a blow, 30 lectures already prepared, or that were in the course of preparation; all the practical exercises in working out tactical problems in the field, and the discussions they gave rise to; and broke up the "school of application," as the North Atlantic Squadron came to be known.

Following this came:

NAVY DEPARTMENT, WASHINGTON, D. C., January 11, 1889.

GENERAL ORDER No. 365.

Under a provision contained in the act entitled "An act making appropriations for the naval service for the fiscal year ending June 30, 1889, and for other purposes," approved September 7, 1888, the institution on Coasters' Harbor Island, in the harbor of Newport, Rhode Island, known as the "Naval War College," is hereby consolidated with, and made a part of, the Torpedo Station on Goat Island, in said harbor, which station, as consolidated, will hereafter be known as the "Naval Torpedo Station and War College" and is placed under the command of the officer in charge of the torpedo station.

The library and movable property beloging to the Naval War College will be transfered to the Naval Torpedo Station and War College.

The custody and control of the large building and surrounding structures, with the adjacent grounds, on Coasters' Harbor Island, heretofore occupied for the purposes of the Naval War College, will be turned over to the Bureau of Equipment and Recruiting for the use of the Naval Training Station on that Island.

The establishment of a more thorough system of instruction, to be pursued at the Naval Torpedo Station and War College, being now under consideration, suitable orders relating thereto will, after such system shall have been adopted, be issued by the department.*

WILLIAM C. WHITNEY,
Secretary of the Navy.

In his annual report of December 1, 1888, the Secretary of the Navy stated that: "In each of the annual reports of this Department for the last three years attention has been called to its unbusinesslike methods, etc." The case under consideration furnishes a singularly apt illustration of the truth of this statement. There were three bureaus concerned. An executive order had placed the war college under the Bureau of Navigation, and assigned to its use the old Poor House on Coasters' Harbor Island, then vacant. But the Bureau of Equipment having the training system under its charge wanted the entire island, buildings and all. It was, therefore, decided to get rid of the war college. The simplest way to do that was to transfer it to the torpedo station. But the Chief of the Bureau of Ordnance did not want it there: "I suggest for your consideration" (he wrote to the Secretary of the Navy), "the evident advantages of discontinuing this class" (the war college class), "at the Naval Torpedo Station." (Report of October 15, 1890.) Poor college!

It had become a waif: a *nullius filius!*

The president of the war college, Captain Mahan, who had not been consulted on the question of transfer, entered a vigorous and conclusive argument against this sudden change. "If by '*consolidation,*'" he wrote in his report of October 13, 1888, "is meant the merging of two lines of thought radically distinct, and, in temper of mind opposed, under a single directing intellect, the result will be the destruction of one or the other." "The torpedo station deals with *materiel.* The conduct of war, on the other hand, which is the object of the college, from management of single ships up to that of a naval campaign or the naval policy of a country, is affected by conditions wholly different from those which modify the action of the materials from which the naval weapons are made, under the stresses to which they may be subjected; and hence the habits of mind and interests engendered by the pursuit of physical research or of mechanical invention, tend more and more to diverge from, and to look coldly upon, the in-

*No such orders were ever issued.

vestigation of the problems of war." "If '*consolidation*' means that the development of the art of war, and of torpedo manufacture, are to be carried out by the same man, one or the other will dwindle and disappear, and the sufferer will be the art of war, because, though of the first importance, it is less consonant to the present temper of the age, and, as yet of the navy; it is younger, weaker, more unfriended."

Too true! It was the study of the art of war that was to "dwindle and disappear." Cast out from Coaster's Harbor Island, its original habitat, and not wanted at the torpedo station, the war college languished in the uncongenial surroundings of Goat Island to the verge of extinction.

In the address of the president of the war college, Captain A. T. Mahan, U. S. Navy, at the opening of the fourth annual session, August 6, 1888, he said: "Last year, Congress refused to make any appropriation for the college, and the work has been pursued during the last 12 months, and more, under the apprehension that similar action would be taken in the present session; and so compel the abandonment of the work. This fear has been happily removed." . . . . "Besides the doubt as to the action of Congress, involving the whole question as to whether our really arduous work would be wholly thrown away, there have been other drawbacks and disappointments, which, as they affect the cause, must be mentioned." He then proceeds to detail the obstacles which the college had to overcome. No one not actually engaged in the campaign can understand the number, variety and, at times, gravity of those obstacles. Let them now be forgotten!

Fifth term—1889. The consolidation of the war college with the torpedo station necessitated the transfer of the college from under the general supervision of the Bureau of Navigation to that of the Bureau of Ordnance. In the annual report of the latter, October 16, 1889, it is stated that "pursuant to the act of Congress approved March 2, 1889, the Naval War College has been consolidated with the torpedo station. . . . . "On the conclusion of the course of torpedo instruction a war college class of three months was inaugurated, the members of the class being mostly the same as those who had composed the torpedo class."

By a reference to the report it will be seen from the list of lectures given that they all treated exclusively of military or naval matters either on shore or afloat, as in previous years, and were not on "miscellaneous subjects," as stated in the memorandum.

The sudden change of attitude on the part of the secretary towards the college is readily accounted for. The relations between the secretary and his Chief of Bureau of Navigation had become strained. He seems to have become dissatisfied with the manner in which details of officers to duty had been made; hence his order of August 4, 1888, assigning to a board of bureau chiefs the duty of detailing officers to duty. The order added, that "This order is not intended as a reflection upon the method of making the detail heretofore in use by the Department, etc." * However that might be, the college lost the influence of its strongest supporter (navigation) and left the field clear to the Bureau of Equipment of the Board of Detail, whose interest in the training service led it to oppose the college.

The Sundry Civil Act of August 7, 1882, provided "for repairing and extending wharf and the erection of boat-houses on Coaster's Harbor Island five thousand dollars. *And the cession by the State of Rhode Island to the United States of said island for use as a naval training station is hereby accepted.*"

Equipment took the ground that the training station was for naval apprentices only, whereas the Secretary of the Navy assumed that "naval training" included officers as well as the enlisted force. At any rate the island became government property, and Congress had exclusive jurisdiction over it, Equipment to the contrary notwithstanding.

In the naval appropriation act of March 2, 1889, appears the following item: "For the construction of a building for use by the Naval Torpedo Station and War College as consolidated by order of the Secretary of the Navy January 11, 1889, one hundred thousand dollars to be immediately available, said sum in full for all expenses of designing, erecting and furnishing said building."

Thus by a formal act of Congress the war college was to be permanently established on Goat Island, and a site for the new building was actually selected. The enemies of the college had "won out," as the saying goes.

To revert to the memorandum attached to the letter of the Secretary of the Navy to the president of the war college, dated

* The inquisitive in such matters are referred to Secretary Chandler's order of October 4, 1884, appointing a "Board of Detail," the chief function of which was to abolish "favoritism in navy" in the assignment of officers to duty. This order was re-enforced by Secretary Whitney. The office of detail had formerly belonged to navigation exclusively.

August 1, 1888, it was stated that "the amendment to the naval appropriation act, inserted by the Senate, directing the Secretary to consolidate the war college and torpedo station," is understood to have been in accordance with an agreement entered into by the Secretary of the Navy, Mr. W. C. Whitney, and Senator Aldrich, of Rhode Island, by which such consolidation should be effected "in the interests of both these institutions." By way of a *douceur* to the friends of the college, $100,000 was appropriated for a building for the war college, as we have seen. The material aid rendered at this time by Senator Aldrich must ever be held in grateful remembrance by the friends of the college.

It was in this state of the college affairs that a change of administration took place. Under date of November 30, 1889, the Secretary of the Navy, General B. F. Tracy, reported to Congress: "Recent legislation and administrative regulation has so far complicated the situation of the Naval War College at Newport, R. I., that the Department does not feel justified in undertaking the construction of the building authorized March 2, 1889, until Congress shall have expressed itself more definitely on the question of the site." "The Department feels no doubt, however, as to what that site should be. Goat Island has a restricted space, which is already sufficiently taken up. . . . . On the other hand, Coaster's Harbor Island offers an excellent site with an abundance of room." . . . . "The present condition of things, in which the college is made a sort of appendage to the torpedo station, under the Bureau of Ordnance should be corrected. It is attaching the greater to the less. The work of the Bureau of Ordnance has no connection with that of the war college and no reason can be assigned for placing the college under that bureau. The war college is, unquestionably, one of the most important institutions connected with the navy." "Its establishment in 1884 represented a marked advance in naval development. Its work, even in the restricted sphere to which it has hitherto been confined, has been of immense benefit to the service, and it is of the highest importance that nothing should be done that will in any way interfere with its efficiency." "For the present the Department has only to recommend that the building for which appropriation was made at the last session be placed on Coaster's Harbor Island, and that the appropriation be made under the head of 'Bureau of Navigation.'" And further on in the same report (page 49) reference is made to "the foundation of the war college, which has developed the study of problems of

modern warfare in a manner at once scientific and practical." General Tracy brought to the administration of the affairs of the navy a wide experience in public life and a fine military record gained in the Civil War. He was thus enabled to appreciate the military character of the naval profession.

On July 11, 1890, Professor James Russell Soley became Assistant Secretary of the Navy. Professor Soley had been a member of the college faculty, having occupied the chair of marine international law. He was a staunch and an appreciative friend of the college and had already, by his many good offices, placed it under a deep debt of gratitude. Under the circumstances Secretary Tracy deemed it expedient to place the college under his supervision, much to the gratification of the friends of that institution.

Agreeably to recommendation of Secretary Tracy the naval appropriation act of June 30, 1890, contained the following item: "*Bureau of Navigation. Naval War College* and *Torpedo School* on *Coaster's Harbor Island:* For maintenance of the Naval War College and Torpedo School on Coaster's Harbor Island ten thousand dollars; and the Secretary of the Navy is hereby authorized to cause the building for use by the war college and torpedo school, for the construction of which the sum of one hundred thousand dollars was appropriated in the act of March second, eighteen hundred and eighty-nine, to be erected on Coaster's Harbor Island."

Turning now to the annual report of the Bureau of Navigation of October 15, 1890, we learn that the act of Congress making the appropriations for the navy approved June 30, 1890, having transferred the Naval War College and Torpedo School from the torpedo station to Coaster's Harbor Island, "plans for the college building are now being prepared."

1890. There was no war college term this year.

Thus ended one stage of the campaign. The Bureau of Equipment and Recruiting had gained its point. General Order No. 365 of January 11, 1889, had assigned the building that had been used by the college to the officers of the training service. Henceforth, there was to be no more friction between the two. The war college was to have its own building; the training service had its buildings. It was hoped the two would now live together in peace. That hope, unhappily, was not to be realized.

The sixth war college term, 1892, was under Captain Mahan, as president.

The Chief of Bureau of Navigation, under date of October 25, 1892, reported that "the building for the Naval War College and Torpedo School on Coaster's Harbor Island, Newport, R. I., has been completed and the college was opened September 1. Twenty-two officers are attending the course of instruction which will continue until the 31st." The report of the president of the war college is not included this year among the papers appended to the annual reports.

The Secretary of the Navy, however, in his annual report of December 10, 1892, states that "The Naval War College and Torpedo School has been reopened in the new building constructed for the purpose," adding: "The Department is deeply impressed with the importance of the college to the navy, as a means for insuring the development of the science of naval warfare as distinguished from the development of the naval *materiel*," etc.

1893. There was no college course this year, nor is there any hint in the annual reports of the Secretary of the Navy or the Chief of the Bureau of Navigation going to show why the college term was suspended. The annual report of the secretary, the Hon. Hilary A. Herbert, of November 18, 1893, page 52, simply says: "during the past season I visited and inspected personally . . . . the war college and torpedo station."

With the exception of the estimate "of $8000 for maintenance and care of grounds," the Bureau of Navigation is silent on the subject. This silence boded no good to the college.

With a change of administration came another change in the policy of the Department in regard to the college. Secretary Herbert as chairman of the Naval Committee of the House had earnestly advocated removing the college to Annapolis (see Congressional Record, June 18, 1886, page 6134). The Bureau of Navigation was unfriendly, and Equipment was an avowed enemy. Matters looked squally! On May 11, 1893, Captain Mahan, president of the college, while engrossed by his arduous labors, was suddenly detached and ordered to the command of the U. S. S. *Chicago*.

Among the "lectures on miscellaneous subjects," referred to in the *memorandum* of the Navy Department of August 1, 1888, were the lectures delivered by Captain Mahan, which were subsequently published under the title of "The Influence of Sea Power upon History." This course of lectures gradually expanded until they covered the entire field of naval science, including naval

strategy. This led the lecturer to see the importance to the United States of the Sandwich Islands. These views finding their way to the public press were not satisfactory to the administration, the policy of that day being to oppose the acquisition of those islands. Whether the detachment of Captain Mahan from the college was in consequence of those publicly expressed views of its president or not, cannot be affirmed; but it certainly had the appearance of cause and effect. It is the man at the mast-head who first cries out "Land O!" Now everybody can see the value, from a military point of view, of the possession of that naval base, the Hawaiian Islands.

On the detachment of Captain Mahan, the command of the college devolved upon Commander C. H. Stockton. The Department was informed that arrangements had been made for a summer course; but no class was ordered; the Office of Detail could find no one to send!

November 15, 1893, Captain Henry C. Taylor, U. S. N., was ordered to the college as its president.

The Training Service.—To a full understanding of the history of the war college a few words in relation to the training service are necessary.

The "circular relating to the enlistment of boys in the U. S. Naval Service" of April 8, 1875, provided that the naval apprentices on enlistment should be sent to the *Minnesota*. It was intended that all the training of boys for the navy should be on board ship. In the U. S. Navy Regulation Circular No. 33, of June 4, 1883, it was stated that:

> Coasters' Harbor Island having been ceded and conveyed to the United States by the State of Rhode Island, the Naval Training Station at that place is hereby permanently established. The training system . . . . will be under the immediate supervision of the Bureau of Equipment and Recruiting . . . .
>
> A suitable vessel will remain permanently at the station . . . . *No apprentices, nor any of the personnel attached to the institution, shall be quartered on shore.*
>
> (Signed) WM. E. CHANDLER,
> *Secretary of the Navy.*

The *Minnesota* proving of inadequate size for the purpose, her place was taken by the *New Hampshire*, one of the old line-of-battle ships. The *New Hampshire* as the "permanent" school ship was moored in the stream. In an evil hour she was hauled in and tied up to a wharf where she made a bed for herself in the

mud; surrounded herself, in due time, with a cesspool, and, in consequence of sickness aboard, had to be hauled out in the stream again. (See report of medical board of August 31, 1889.)

An effort was now made to have the training station transferred to New London, and the *New Hampshire* was sent there as a preliminary step. Thus it came about that the naval apprentices were marooned on the Island. Some of them were put in the rigging loft which was fitted up for their use, and others put under tents. Some of the officers were actually quartered in the war college building by orders from the Secretary of the Navy. (See letter of the Secretary of the Navy in answer to resolution of the Senate of February 19, 1895.) This was an entering wedge to get possession of the entire building.

The opposition to the war college now became more pronounced than ever. Navigation had reported: "the institution (the college) whose novel plan and methods in the beginning awakened sharp professional criticism," etc. And Admiral Porter wrote: "The Naval War College is but the beginning of an institution that will in the future, I believe, confer great benefit on the service. There are some officers who retard its progress by their opposition, etc." (Annual report of 1885.) And again: "The war college has encountered a most remarkable opposition ever since its establishment." (Report of 1888.) That opposition grew in intensity and was transferred from the abstract question of *a* college to those of its advocates who represented it.

The tension had now reached the acute stage. The officers of the training service exhibited towards the officers of the college a vindictive spirit that strained the relations to a point approaching rupture. They had succeeded in getting possession of a part of the college building, and aimed at getting the whole. The Secretary of the Navy, Mr. Herbert, was known to be unfriendly, and certain of the bureaus or their representatives were open and active enemies. "In six months my boys will be eating their grub in the lecture room of the war college!" was the proud boast of the commanding officer of the training station. Few and short were the days of the college!

In August, 1893, Secretary Herbert on board the *Dolphin* visited Newport, for the avowed purpose of breaking up the war college. He came, he saw, and was conquered. "What hast thou done unto me?" cried Balak, King of the Moabites, "I took thee to curse mine enemies, and, behold, thou hast blessed them alto-

gether." "When I started out on this trip," Mr. Herbert declared, "I meant to break up the war college . . . . but now I intend to do all I can to assist it," and he was as good as his word. Subsequently in an address at the college he said:

> The opinion was once widely entertained that this college was intended for a post-graduate course and that, this being so, it should be located, *if allowed to exist at all*, at the Naval Academy. I was of this opinion myself until three years ago on a personal visit I inspected its workings and examined fully into its plans and purposes. Then I discovered, what the public is beginning to understand, and what the navy itself is now coming fully to appreciate, that it is in no sense a post-graduate course that is being pursued in these walls; that not only are the theory and art of war being thoroughly studied and developed here, but knowledge is being acquired and practical information is being amassed without which the Navy Department cannot possibly, in the event of war, utilize the naval resources of our country.
>
> Ships and guns, torpedoes and men, are all of little use unless officers know how to fight them. Individual ships, however bravely and skilfully they may be handled and fought, can accomplish but little if officers do not know when, where and how to dispose them; while at the same time skill in handling, courage in fighting, and knowledge of the proper disposition of ships in battle, will often all be of little avail without continual and prompt supplies of everything needed in the exigencies of war, all of which must be reckoned beforehand. Successful war means all of these things and more besides. It means, if the exigency requires, the exertion by a nation of its utmost power, the utilization of all its resources, the tapping of every source of supply, the employment of every manufactory, every ship and every man that can be useful, and all this with the utmost promptitude and dispatch. Further than this, plans of attack and defense must be devised, and these cannot be successfully made without the most accurate knowledge of harbors, inlets, safe and unsafe passages, tides and everything else pertaining to the possible theaters of impending war. A study of these and still other problems constitute the work which, I am glad to say from a careful personal inspection of results, you have been successfully performing during the years just passed. I congratulate you, gentlemen, and you particularly, Mr. President,* upon the results you have achieved. For myself I shall rejoice, if when I shall lay down the office I now hold, it can be said I contributed, in such a manner as I could, to the successful workings of this institution.

This frank and manly admission by Mr. Herbert of his former error in judging of the college on insufficient grounds, and the very handsome manner in which he atoned for that error, redound greatly to his credit.

Mr. Herbert's experience in the Southern Army during the Civil War enabled him to understand and appreciate the true character

*The late Rear Admiral H. C. Taylor, U. S. Navy.

of the war college. But although Mr. Herbert had become, through his own personal examination, a convert to the college views, he was still to a certain extent influenced by the more aggressive party opposed to it. General Order No. 421 of March 14, 1894, consolidated all the stations at Newport, and the commanding officer of the training station was put in general command of all. This put the college under the command of its most pronounced enemy, which made it exceedingly unpleasant, to put it mildly, for the officers of the college.

This was followed by General Order No. 496 of Acting Secretary of the Navy, the Hon. Charles H. Allen, revoking the order of consolidation.

All these various plans for disposing of the war college seem to have originated from the same source. The report of the Phythian Board of 1891 had proposed uniting all the Newport stations under one head. Nearly every one, save those most concerned, had some different plan of his own for the college. The Bureau of Navigation wanted a "real war college" of its own design—"the country thus having a *real* war college where the art of war can only be practically learned at sea." The letter of the Bureau of Navigation, giving a plan, will be found in the Army and Navy Register of November 20, 1897; also the letter of Captain Goodrich, at the time president of the war college.

The Hon. Charles Herbert Allen, Assistant Secretary of the Navy, wanted the war college to be sent to Annapolis.* He advanced six reasons in support of his proposition. His views have no interest save as they reflect those of the bureaus inimical to the college. The arguments of Mr. Allen (which had been advanced long before by Mr. Herbert) would apply with equal force to the transfer of the artillery school at Fort Monroe to the military academy at West Point. He overlooked the fact, as others had done, that the college had been located at Newport by Act of Congress, and nothing short of an Act of Congress could dislocate it. Others again thought the college should be in Washington, D. C., and so on. "He that builds by the wayside has many masters."

Comments on departmental business methods are unnecessary: the bare record as given in the present case justifies the severest strictures that have been made upon it.

* See Report of the Assistant Secretary of the Navy of November 15, 1898.

Captain Henry C. Taylor, U. S. Navy, reported for duty as president of the war college on the 15th of November, 1893, as already stated.

When Secretary Herbert visited the war college in 1893 for the purpose of breaking it up, as narrated, he took the precaution to look into the reasons to justify his action. He then became convinced that so far from there being just cause for such a proceeding there was every reason why the institution should receive his support. As a result there will be found in his annual report of November 17, 1894, the warmest commendation of the college and its methods. "My careful examination of this whole question greatly impressed me with the importance of at once establishing the institution upon a firm and substantial basis." It had been the intention of the Department to supplement the college course with exercises in the North Atlantic Squadron, but the exigencies of the service did not admit of it.

Term of 1894.—The seventh term opened June 12, 1894. The annual report of the president, Captain H. C. Taylor, is particularly interesting and encouraging. The class consisted of 25 officers including Commander C. G. Flach, and Commander Baron Ugglas, both of the Royal Swedish Navy; two officers of the U. S. Revenue Marine and three officers of the Rhode Island Naval Reserves.

The report states that "throughout the term of nearly four months a valuable course of reading has been carried on on international law, strategy, naval and military history and biography, etc. "The desire on the part of the members of the class to read and inform themselves in professional subjects appears to have been notably quickened by the war problems upon which their minds have been concentrated." "The results of this summer's course, which are far beyond my most sanguine anticipations, justify my urging upon the Department a continuance of the war college." "Its scope," he adds, "not to be increased, but the field in which it works can be more thoroughly and satisfactorily covered if the work be made continuous and the college be recognized by the Department as a permanent institution with a small regular staff." Here we find from this very able officer a clearly expressed doubt of the permanency of the college. The report is addressed to the Assistant Secretary of the Navy.

1895. *Eighth Session.*—Secretary Herbert in his report of 1895, continues his intelligent and appreciative notices of the war

college. "Under the able superintendency of Captain H. C. Taylor, U. S. N.," he writes, "this institution has, during each of the two past years, made a distinctively forward step. It can no longer in any quarter be regarded as a post-graduate school to carry officers forward in the theoretical studies pursued at Annapolis; but it now stands out clearly as an undeniably practical institution for the study of war as a science, evolved from historical research, and of war as an art, applied to problems arising out of hypothetical and possible cases of attacks upon and defenses of our own country, its coasts, and cities."—"That it was to be a school of war, and nothing but war, was not at first recognized by the public mind in or out of the navy."

The report of the president of the "Naval War College and Torpedo School" for 1895 (Captain H. C. Taylor), shows continued progress. The course opened June 1, 1895, with a class of 25 officers with the addition of Lieutenant T. Fritsche of the Royal Danish Navy; one officer of the U. S. Revenue Service and one officer of the Rhode Island Naval Reserves. The report gives a summary of the work done adding: "In conclusion I am happy to be able to state that the session just drawing to a close has been even more successful than that of last year. The approval and support of the officers in attendance, corroborating those that have gone before, may well be taken to represent the established conviction in the service of the serious importance of the study of the art of war."

The opposition to the college was beginning to be less manifest.

Ninth Session. 1896.—The Hon. H. A. Herbert, Secretary of the Navy, in his annual report of December 2, 1896, continues his very interesting and illuminating notices of the war college. He states that: "The Department during the last three years has given every possible aid and encouragement to the war college and the results have been most gratifying." After making some pertinent remarks on the general subject, which are well worth reproducing here did space admit, he adds: "there has been nothing in our naval history to turn the minds of naval officers in the direction taken by the studies which have occupied the war college during the last three years."

The president of the college, Captain H. C. Taylor, under date of October 10, 1896, reported that the college opened on the first of June with 28 officers of the navy in attendance, and a number of officers of the State militia. Among the latter appears the name

of Lieut. T. H. Newberry, of the naval militia of Michigan, and more recently Secretary of the Navy.

The following named gentlemen, on the invitation of the college, delivered addresses during the session as follows:

Hon. H. A. Herbert, Secretary of the Navy: "On the Sea and Sea Power as a factor in the History of the United States."

Hon. John A. Kasson: "International Arbitration and its effect upon National Politics."

Hon. E. J. Phelps: "The relations of the Navy to Diplomacy."

Gen. Francis J. Lippitt: "The rights of Vessels in Foreign Ports."

Prof. T. S. Woolsey: "The right of Search and its Limitations in Time of Peace."

Mr. Charlemagne Tower: "Military Operations of Sir William Howe in the War of Independence." (Two lectures.)

We must here take leave of Mr. Herbert with the grateful acknowledgments of the friends of the college for his sympathy and support. His paper above referred to is a very valuable contribution to the college literature. It was subsequently printed in pamphlet form for distribution. An extract from it has been already given.

"In conclusion," the president of the college writes, "it affords me pleasure to state that the session which has just drawn to a close has been even more successful than those of the two past years. The sentiment of approval of the college methods has rapidly gained ground during the past few years among the officers of the navy and many distinguished citizens."

The opposition to the college seems from the later reports to be subsiding.

Tenth Session. 1897.—"The recent session of the college extended from June 1 to September 15," writes the Secretary of the Navy, the Hon. John D. Long, in his report of November 15, 1897. Twenty-one officers of the navy and one of the army attended the course; also four officers of the naval militia." He states further that "the work of the college is of importance and value to the service."

Commander C. F. Goodrich, U. S. Navy, relieved Captain H. C. Taylor as president of the college December 31, 1896.

"The course was opened," Commander Goodrich reports, "with an able address by the Hon. Theodore Roosevelt, Assistant Secretary of the Navy, which has been printed and distributed to the service."

At other times during the summer the officers had the benefit of listening to addresses by well-known civilians on subjects closely concerning naval officers and the relations to our international policy, as follows:

Hon. John D. Long, Secretary of the Navy.

Moorfield Storey, Esq.: "A Civilian's view of the Navy."

General Francis J. Lippitt: "Naval Captures."

Charles H. Cramp, Esq.: "The necessity of Experience to Efficiency."

Hon. C. S. Hamlin: "International Law of the Bering Sea Question."

There were a number of other lectures on professional subjects, viz.:

Captain A. T. Mahan: "Strategy."

Captain H. C. Taylor: "Naval Tactics."

Commander C. F. Goodrich: "Coast Defense," etc.

The report continues: "In conclusion it affords me pleasure to state that the session which has just drawn to a close has been, it is hoped, no less successful than those of the past three years. The sentiment of approval of the college methods has rapidly gained ground during the past few years among officers of the navy and many distinguished citizens and by none more than those officers, who, coming with a prejudice against the institution, have left it with an undisguised sympathy with its ends and practices. Prejudice is the child of ignorance. When the great majority of officers shall be alumni of the war college there will be less criticism of its purposes."

It may be stated here, parenthetically, that "prejudice," the offspring of ignorance, still exists, and this too, notwithstanding the fact that the college has been in existence for a quarter of a century. It has been shown that each president of the college in succession has spoken in the most encouraging manner of the growing interest of officers in the higher branches of their profession; but when it is considered that at each session of the college only from 20 to 25 officers attend, for only about four months each year, it will be a long time yet before the great body of the navy will be alumni of the college. The college staff, moreover, is numerically, wholly inadequate.

In the annual report of the Secretary of the Navy of November 15, 1898, there is no direct allusion to the war college. But there is clearly an implied reference to it. On April 21, Congress declared war against Spain. The study of the art of war in the col-

lege was now transferred to the practice or the art in the theater of actual hostilities. The Secretary, while not using the word "college," yet recorded a very important fact intimately connected with it. He informed Congress, through the President, that: "The Naval War Board as finally constituted during active operations in the recent war" (with Spain), "was composed of Rear-Admiral Montgomery Sicard, Captain A. S. Crowninshield, and Captain A. T. Mahan (retired), and was constantly in session at the Navy Department. It was equal to every demand, and through it, proper control was exercised by the Department over all movements in the field! at the same time all officers there were left ample discretion and were never hampered in their work. The board was charged with delicate and most important duties, and yet the Department is not aware of an error in its performance of them." . . . . "The head of the Department can only, in a measure, aid with a touch here and there. Untrained in the art of naval warfare, without professional knowledge of the technicalities of the service, he is at best only the director of its general progress." *

On the Naval War Board Captain Mahan stood for the war college. Now one of the principal objects the war college had in view was to enable officers to prepare themselves for the very duty for which the secretary so highly commends the Naval War Board; for duty, in short, as members of the Naval General Staff which it was hoped would some day be recognized as indispensable to a form of naval administration founded on the canons of common sense. The General Board of to-day is the outgrowth of the Naval War Board of the Spanish War. The navy owes this to the late Rear-Admiral H. C. Taylor, who was one of the very strongest friends of the college from its earliest inception; and an earnest and judicious advocate of all the college stood for.

It must strike anyone at all conversant with naval matters that if a Naval War Board hastily convened at the breaking out of war was such a very important factor (as it undoubtedly was), it would be a far more important factor if convened long in advance of war. For 13 years before the Spanish War the college had been preparing for war in spite of much opposition, and for 13 years Congress had known that the Navy Department was totally un-

* This is, in substance, just what Secretary of the Navy, Hon. W. C. Whitney, reported to Congress thirteen years previously. (See "The Department of the Navy," p. 94, NAVAL INSTITUTE, Vol. XXXI.)

prepared for war. Such is its legal status to-day. Fortunately for the country, steps have now been taken to put our business methods in better shape, so that, in the event of a recurrence of hostilities—which Heaven forbid—the Naval War Board or its equivalent, may not be found wanting.

The Spanish War freed the college from active opposition. The president of the college became a member of the General Board and thereby a participant in administering the affairs of the navy. Henceforth the status of the college was assured. We may now concern ourselves with results only and go back to the beginning of its career to show its aims and objects. Naval strategy was made one of the principal branches of investigation. As there was no treatise on the subject, an immense amount of history had to be gone over to learn what had been done in past ages in that respect. There were works, however, treating of military strategy; these had to be studied, and, by what is commonly known as the "comparative method" of investigation, was evolved naval strategy. This raised naval warfare from the empirical to the scientific stage.

Grand tactics, or the tactics of admirals, could be learned only by an analysis of the great battles of the past, hence a careful study of naval history was necessary. To the foregoing subjects was added the laws of war, as treated under the head of marine international law.

One of the first steps in the establishment of an institution somewhat novel in its character, was to furnish the facilities for carrying on these studies and to suggest certain lines that might be followed to advantage.

The foundation once laid, is was assumed that those who were to conduct the course, *conjointly* with those in attendance, would rear the superstructure. To this end a few officers came together each one of whom took up a particular branch of study. The results of those studies were given out in the form of lectures, and the freest discussion invited. Contributions by members of the class in attendance were cordially invited and gratefully received. Such is the case to-day. In short the college is, to borrow a term from political economy, a sort of co-operative or joint-stock affair, where all work in unison for the common good.

The next step in the process of development was to get at the philosophy of navies, to show the reason of their being, their influence on the destiny of the state, and their true functions in peace as well as in war. The necessity of a navy to a maritime

state having been shown, then its relative proportions were to be determined, as well as its character due to the position held by the state in the great family of nations, and the foreign policy sought to be carried out—whether the attitude of the state was to be purely defensive, or whether it was to be the offensive-defensive, that is, to defend by assuming the offensive. If the latter, then to show the necessity at all times for an advanced state of preparation. Thus was emphasized the fact that one of the most important factors of naval strategy belongs essentially to a time of profound peace. These and kindred subjects are among the largest and most important that can engage the attention of the naval officer who aspires to serve on the Naval General Staff, or to command a fleet during war.

That is one meaning of college. It is a place of original research on all questions relating to war and to statesmanship connected with war, or the prevention of war.*

It will be seen from what has just been said of the "philosophy of navies" that the lectures on those broad lines led quite naturally to the consideration of the influence of a navy on the history of a state and thence on history generally. These lectures covered a wide field, and treated the subjects under consideration in the most exhaustive manner. They made clear how in the beginning ocean commerce gradually expanded and became a source of wealth and power to the state; how vessels engaged in that commerce were often obliged to be armed to guard against piracy; and how vessels of the state armed for the purpose had to be sent out to protect those engaged in foreign commerce; hence arose navies. Those navies were erected upon a foundation of ocean commerce. The great minister Colbert, under Louis XIV, we are told, inaugurated the brilliant reign of that king. The wealth of France was to be developed on the lines of production encouraged, trade stimulated to healthful activity, a large merchant shipping, a great navy, and colonial extension. Some of these are sources, others the actual constituents, of sea power; which may be said, of a seaboard nation, to be the invariable accompaniment, if not the chief source of its strength. The development of the greatness of France went on rapidly for a few years. Then came the parting of the ways, Louis drove the Dutch carrying trade to the ships of England, and sacrificed the growing commerce of France.

* See Address, Naval War College, 1903. NAVAL INSTITUTE, Vol. XXIX, No. 3.

Thus England gradually forged ahead to the front rank as a sea-power; even in war her prosperity was great. The merchant shipping of France on the other hand was stricken and the splendid growth of the Royal Navy, "that had excited the jealousy of England, was like a tree without roots; it soon withered under the blast of war."

Our experiment of building a formidable navy without the foundation of a mercantile marine is one that will be watched abroad with interest. The fact that our fleet when circumnavigating the globe had to depend for supplies on foreign shipping suggests that our navy may, like that of Louis XIV, be "like a tree without roots and soon wither under the blast of war."

These lectures delivered at the Naval War College from the chair of naval history were not intended originally for publication. They were not written with that view. But those who had the privilege of hearing them, struck by their originality of conception, the freshness and vigor of the style and particularly the broad and comprehensive views of the matter under treatment, were insistent upon their being put in a permanent form. It was difficult, however, to find a publisher willing to take the risk of putting on the market the work of a comparatively unknown author treating of a subject of little general interest. Through the good offices of a gentleman, himself of cultivated literary tastes, who had heard the lectures and appreciated their value, a publisher was at length found. Such is the origin and growth of the works now known as "The Influence of Sea Power upon History," "The Influence of Sea Power upon the French Revolution and Empire," and "Sea Power in its Relations to the War of 1812," by Captain A. T. Mahan, U. S. Navy. The sea power series covers a period included between the year 1660 and 1815. The by-products include the "Life of Nelson," a standard work, and numerous other contributions to the literature of the naval profession, the whole forming a splendid literary memorial of which any one might well feel proud.

In addition to lectures there have been given out for solution problems dealing with the larger operations of war. These required the use of charts covering the entire theater of war, and a painstaking study of all the attendant conditions. Success in war, it is understood, is largely a question of positions, hence the constant study of maps. The laboratory method has also been employed with success. *Ex pede Herculem.*

It is well understood that in going through the war college

course there is nothing approaching compulsion. An officer may avail himself of the advantages offered him or not, as he pleases; but it has been found that interest in one's profession is the only incentive needed. That has sufficed. Knowledge acquired by self-effort is more thoroughly assimilated than knowledge acquired from lectures. It is a healthy and hopeful sign when officers who have made good use of their time at the college during the all-too-short term, are anxious to return to it. They have discovered that there is more in their profession than they had dreamed of; that while they had been completely absorbed in the study of a part, they had lost sight of the whole. Specialization must not be carried to excess.

It was fortunate indeed that the chair of marine international law should have been filled, at first, by so competent a person as Professor Soley.

Professor, now the Hon. James Russell Soley, a graduate of Harvard and of the Law School of Columbia University, was for some years at the head of the department of history and law at the Naval Academy. His familiarity with naval affairs qualified him in an eminent degree to treat of those parts of marine international law which most nearly concerned naval officers and their treatment of international questions on foreign stations. His lectures, always interesting and instructive, were listened to by those in attendance at the college with marked satisfaction. Their literary style was of a high order. It has been a subject of great regret that they were never published.

To Rear Admiral C. H. Stockton, U. S. Navy, is the navy indebted for the Naval War Code. This code has received official recognition. In his letter of instructions to the United States delegation to the Hague Conference of 1907, the Secretary of State, Mr. Root, wrote: "As to the framing of a convention relative to the customs of maritime warfare you are referred to the Naval War Code promulgated in General Order 551 of the Navy Department of June 27, 1900, which has met with general commendation by naval authorities throughout the civilized world, and which in general, expresses the views of the United States, subject to a few specific amendments suggested in a volume of international law discussions of the Naval War College of the year 1903. The order putting this code into force was revoked by the Navy Department in 1904 *not* because of any change of views as to the rules which it contained, but because many of these rules, being imposed upon the forces of the United States, by the order,

would have put our naval forces at a disadvantage, as against the forces of other powers upon whom the rules were not binding. The whole discussion of these rules contained in the volume to which I have referred is commended to your careful study."

Again: in reply to the invitation of Great Britain to assist at an international conference in order to arrive at an agreement as to the generally accepted principles of international law, the United States Government recognized once more, in the most formal manner, the authority of the Naval War College on questions of this character. Under date of September 5, 1908, the Secretary of State wrote to the British Ambassador . . . . "I have the honor to transmit herewith copies of the Naval War Code of 1900 and of the volume of international law discussions of the Naval War College for the year 1903 containing amendments to be made to the Naval War code of 1900, to serve as a basis of discussion in the conference . . . . , etc." Rear-Admiral Stockton, who, as president of the war college, had prepared the Naval War Code referred to above, and Prof. Grafton Wilson, of Brown University, and lecturer on international law at the college, were the United States delegates to the convention, and are among the signatories of the Declaration of February 26, 1909. That the college has become an exponent of marine international law is due of late years very largely to the ability and industry of Professor Wilson.

It was an implied compliment to the college and the position it had won that Rear-Admiral Mahan, who had, as its president, gained such world-wide distinction, was sent out as the naval delegate to the Peace Conference at the Hague in 1899.

In 1903 Rear-Admiral Charles S. Sperry, U. S. Navy, was ordered as president of the war college. As a direct but wholly unlooked for consequence of his services at the college he was sent, June 19, 1906, as a delegate to the Geneva Convention for the Treatment of Sick and Wounded, and in June, 1907, as naval delegate to the Second Hague Conference where he acquitted himself with great credit.

Thus in the broad domain of war as well as in the field of marine international law the college has justified its being. It has accomplished to some extent what it set out to do: to bring young naval officers to a realizing sense of the true significance of the dignity, variety and extent of their profession.

Under the enlightened system of naval administration now happily inaugurated, the continued growth and usefulness of the college is assured.

DISCUSSION.

The Merchant Marine and the Navy.

(Prize Essay.)

Mr. Lewis Nixon.—I am led to reply to Naval Constructor Roberts' article by the importance of its subject rather than by any desire to answer its misrepresentations of my position and motives.

It is much to be regretted that the Institute has put the seal of its approval upon the collection of unproved, and in my opinion unfounded, assertions that constitute this essay. Before criticizing it, however, let me briefly dispose of personal references.

My own time and my own money are given solely in any efforts I make for the rehabilitation of our merchant marine. I am not building any commercial vessels for my own country and do not expect to and so am not influenced by personal interest.

I have studied the laws and commercial histories of my own and other countries and have matured opinions which I do not hesitate to express, because they have at least foundation of fact and precedent. And yet I do not abuse or misrepresent others because they differ with me. Perhaps I am even vociferous in my advocacy of preference for American ships. Many years of study and an average intelligence will absolve me from the charge of being unwitting, hence the author's words cannot fail to give the impression that such work as I have done is in the interest of foreign shipbuilders. Such an insinuation, whether intentional or not, requires no other answer than that it is absolutely false. The foreign steamship interests fear one thing—discrimination—and they do not fear subsidies.

As regards the National Commerce Convention in Washington, I pointed out what in my opinion is the prime necessity of shipping legislation, that it should be non-partisan, and as the idea seemed to prevail that free ships must be conceded in case all efforts were not to fail, I suggested that this should be limited to foreign ships not over three years, and that the policy should not continue more than ten years. I have defended the American shipbuilder in every speech made and without sneaking and whining about higher wages defeating our chances of competition when work is carried on in a wholesale specialized way. We give the lie to such idea in every other line of manufacture, such as of locomotives, bridges, etc.

I do not know anything about "our present merchant marine campaign" to which Mr. Roberts refers, so cannot criticise it, but if his essay outlines it, no wonder it has gone to "destruction on the breakers." If Mr. Roberts had read my remarks, to which he refers and with such legal aptitude dissects, he would have seen that I drew a clear distinction between mail lines under the power "to establish post-offices and post

roads" and a general subsidy to equalize the cost of operation of the ordinary commercial vessel rendering no special service to the Government.

President McKinley, in his letter of acceptance, referring to the discriminating clause in the Republican platform said: "The policy of discriminating duties in favor of our shipping which prevailed in early years should be again promptly adopted by Congress and vigorously supported until our own prestige and supremacy on the sea are fully attained."

Self-sufficient advocates of a policy they do not clearly understand will, of course, dispose of this by saying that President McKinley was wanting in statesmanship and ignorant of political economy.

And since Mr. Roberts has read so carefully as to be able to give weighty opinions regarding our commercial conventions with other countries, we find him at variance with the greatest living constitutional lawyer, Ex-Senator Edmunds, who referring to such treaties said officially:

"We are in the attitude of being able, *without any breach of treaty obligations* to resort to discrimination in respect of vessels and commerce after giving the requisite notice and after the lapse of time referred to."

The essay of Mr. Roberts reminds me of this line of the poet Pope, "To criticise in detail, pointing out all the errors and correcting them, would be a game not worth the candle. Only the graver faults need be noticed."

(1) On page 6 we are informed that

"No merchant marine exists *per se*, or can exist in this day and time. It requires governmental creation and support through a capitalization supplied by the government in the shape of money and favorable laws. All nations do it alike that have a merchant marine. The method of capitalization universally applied is called "subsidizing."

The Commissioner of Navigation reports a total American marine of 7,388,755 tons; of which there is in foreign trade 878,523 tons; and in the domestic trade 6,510,232 tons, in 1909. Do these statistics falsify, and is this marine non-existent. The domestic marine, now exceeding six and one-half millions of tons, never had a dollar of "subsidy" in any form, but from the first has prospered under "regulations of commerce," otherwise called "navigation laws"—the authority for these laws being found in Clause 3 of Section 8 of Article I of the Constitution. The foreign-trade marine "exists" with about an eighth part of it under *postal* subsidy—mail steamers, carrying freight and passengers. It is only the foreign-trade marine, that is under no protection of "navigation laws," that needs any governmental care, and this it needs very much, but cannot get it.

Mr. Roberts states that "all nations" subsidize their marines. This is misinformation—for instance Great Britain does not subsidize her marine, outside of postal payments and admiralty subvention, and rebating the dues for passing the Suez Canal. The Commissioner of Navigation states that "upwards of $46,000,000 are annually contributed," in one way or another, in aiding the world's merchant marine. He agrees with Mr. Roberts in concluding that such contribution or protection is a valid argument for the subsidizing of the marine of the United States. But is it? And, if so, why not adopt the remedy of "ship subsidy"?

These are questions Mr. Roberts has not resolved. Apparently, he is

ill-informed concerning the history of the American shipping trade, and the provisions made for ship protection by the founders of the Government.

The matter is very simple. If the shipping trade should be subsidized, it must be as a matter of *right*, and not as a favor. *Our* government has no favors to bestow; it can deal only with *rights*. If the shipping trade has a right to be subsidized, *so have all other trades*—hundreds of them. That such right exists is absurd, from the fact that its principle could not be carried out. The funds of the Treasury consist of monies received from the tax-gatherer. Citizens of one trade will not vote to tax themselves for the support of another trade. Nor will they consent that the Government make gifts of money to any trade. Why should they? There are better and wiser measures that may be taken.

The fundamental error of Mr. Roberts is this: He does not comprehend that our Government differs from those of the subsidizing countries—that ours is "a government *of* the people, *by* the people, *for* the people." He says, "subsidy is the *sine qua non* of a merchant marine." Citizens wise enough to hold a convention and produce a constitution for a general government of the Union of the States did not think "subsidy" was the "*sine qua non*" for anything, except the hire of Hessian troops. They had no use for it. They avoided the thing as incompatible with liberty, equality and justice.

(2) Mr. Roberts accounts for the advocacy of "discriminating duties" by an assertion that "the foreign shipping interests" take delight in suggesting "quack cures" of our shipping ills. According to our observations these interests have never so much as hinted in any quarter that "discriminating duties" would serve our purpose again as formerly. On the contrary, the British newspapers have frequently stated their opinion that Congress would, before long, adopt and enforce "a liberal ship subsidy policy." Mr. Roberts says: "Where the suckers have failed to take these baits ('free trade,' 'free ships,' 'discriminating duties,' 'tonnage taxes') the aforesaid 'foreign interests,' ('bad manners to 'em') have on one hand raised the cry that subsidies are unconstitutional, and on the other hand they have pointed out that, if subsidies are voted, somebody would get the money"—which was a witty thing to say. But wit and merriment can but poorly hide a piece of sophistry. The "steamship agents" may be bad fellows—rogues, but not fools—but they are all aware of the limitations of our Government, if they are fit for their business, and that is, in part, the steering of the American ship ashore; and they know that it would be useless to state that subsidy is unconstitutional, *if it were not*. For all that is necessarily required to controvert the statement is for the subsidy advocate to put his finger on the "enumerated power" in the Constitution which authorizes Congress to subsidize shipping. If ship subsidy is constitutional, there is clause, and section, and article for it; or it is necessary in carrying out some clause, section and article.

Strange as it may seem, Mr. Roberts avoided the chance to show his knowledge of the case by pointing out what none of his brethren before him has done—the constitutionality of ship subsidy. Abuse of foreign steamship company agents will not go in place of the proof essential to his case. But Mr. Roberts offers nothing but presumption and abuse.

Now, nothing is easier than to prove the full and perfect constitutionality of "discriminating duties." Clause 3 of Section 8 of Article I provides for these, and does so by agreement in the Constitutional Convention that Congress should have the power to make "navigation laws," instead of the States. The States were exercising this power; they gave it up on *condition* that Congress should exercise it in behalf of the shipping of *all* the States, and the States are forbidden to exercise it, by laying and collecting any duties of tonnage or of tariff, for the purpose of ship protection. This arrangement constituted a *compact for ship protection by navigation laws.* Congress carried out this compact, and it is enforced to-day, *fully*, in respect to the domestic trade, *partially*, in regard to the foreign trade. These facts are indisputable.

"Maritime Reciprocity."

(3) Mr. Roberts undertakes to state the facts concerning "Maritime Reciprocity" (page 9), but apparently he has either never read or has not remembered them. He should read "American Navigation" by a brother naval architect, Capt. William W. Bates, president of the Shipping Society of America, Denver, Colorado. Mr. Roberts sums it up thus:

"It will thus be seen, now, that a return to the obsolete discriminatory system as a means of resuscitating the merchant marine is wholly out of the question."

This conclusion, founded on false premises, is as fallacious as that the earth has "four corners."

We have not to "return" to an "obsolete system." The system was not repealed, but is law to-day. Our navigation laws were *suspended* in 1828, with respect to the nations that might wish to reciprocate in the suspension of their laws. About one nation each year came into the arrangement for a term of years, *generally* ten. At the end of the term it continues until either party gives a notice of its intention to terminate the arrangement. These agreements are of a class known as *time limited conventions.* They are not treaties in the full sense, and were intended *to test the practicability of doing without ship protection.* In this they have failed—every nation to-day having all the protection desired—outside of discriminating duties. Every nation that joined in these experimental conventions is perfectly free to "return" to them, at its option, for the terms have expired. Nearly half the nations concerned with us have terminated their agreements from time to time. Were *all* to do so, we would be again *fully under the original system* of ship protection as designed by the fathers, and the subsidy advocates could not help themselves.

As I have said, discriminating duties are the constitutional ship protection, and this is *historically indisputable.* This being the case, we are badly off, if we cannot terminate our reciprocity conventions; for, without an amendment of the constitution, there is no possibility of subsidizing the marine. The way of the constitution is the *only* way until another way has been provided. It is the height or depth of silliness to talk about forcing "ship subsidy" on the people. The people would overturn any unconstitutional act of Congress in one of two ways, by action in the U. S.

Supreme Court, or by a national election. The people did not believe in violating the Constitution to encourage the raising of sugar. They smashed the system put into the "McKinley bill" by electing Mr. Cleveland in his place. A duty now protects sugar-raising. That is the way of the Constitution.

Postal Subsidy vs. Ship Subsidy.

Mr. Roberts states accurately that "Clause 3 of Section 8 of Article I of the Constitution gives power in perpetuity to Congress to regulate commerce with foreign nations, and among the several States, and with the Indian tribes."

Premising thus, he says, "Subsidies were voted and paid under the laws of 1845 and 1847." But this apparent effort to confuse the case is a mere sophistical trick. The mail subsidy acts of 1845 and 1847 rested, *not upon the "commerce clause,"* but upon the post-office and naval clauses—namely, 7 and 13, of the "enumerated powers" of Section 8 of Article I. What is the use of an ostrich burying his head in the sand? What is the use of illusion or delusion on this great subject? "Mail and naval steamers" are just as constitutional to-day as in 1845 and 1847. No one disputes this conclusion. But the attempt to confuse *mail* subsidy with *ship* subsidy is due to ignorance or cunning. It will not go with the people.

But, says Mr. Roberts, "the Senate has repeatedly voted for a subsidy bill, and the Senate lawyers have never seriously raised the point that subsidies are unconstitutional."

Senators voted for sugar bounties. They vote some for and some against each measure presented, but the reasons are not given in all cases. But it is presumable many senators know all about the bearings of the Constitution against ship subsidy. I take notice that no ship subsidy bill passed the House after getting through the Senate. This session no such bill is to be considered in either House, lest the country take alarm and elect some members to stay at home this fall.

Mr. Roberts falls back upon a statement, that the U. S. Supreme Court has held that, "wherein the Constitution does not expressly prohibit, Congress has inherent power to legislate."

This is another vain attempt to twist some court reasoning into authority to violate plain constitutional provisions. There is *a compact for navigation laws for ship protection*—can any reasoning of any court authorize Congress to set it aside, and institute in its place *a gift policy* to be supported by taxation of the people, whereas the discriminating-duty policy *costs nothing?* The mandate of the Constitution is the enforcement of the *compact*—will a court mandate overrule it? What nonsense!

The power of Congress to order the payment of *civil* bounties was discussed and settled *adversely* in 1792, in the Fisheries Bounty bill case. Only under the war power can bounty or prize-money be paid. Industrial protection must be by *trade* regulations, duties and prohibitions. Only the States may pay civil bounties—not the United States.

(5) As a last resort, Mr. Roberts takes his stand upon the changes of time and some very false history. He says:

"Times have changed, however, and discriminating duties are as out of date as piracy."

Discriminating duties are a part of our constitutional law. The abolitionists called slavery "piracy," yet we were bound to return fugitives from servitude while this was fundamental law. The true and reasonable reformer seeks to amend the Constitution, not to override and violate it.

Says Mr. Roberts:

"Aside from the forty reciprocity treaties, containing the 'most favored nation agreements'" . . . .

But it is not true that "forty" treaties of the kind referred to exist—only some twenty-one or two. And the most favored nation clause is not in any of them. Our "maritime reciprocity" agreements relate to ship protection alone.

Says Mr. Roberts:

"I need only recall that we ourselves were forced to abandon discriminating duties on British ships as a result of the War of 1812."

This is the fact: A convention was made for a term of *four* years in which time no discriminating duties were to be charged to vessels of either party. The British were bound equally with ourselves to observe this convention. The act authorizing this convention was repealed three years afterward, and it was the intention at that time to let the convention run its term out and then terminate it. The repeal was to take effect in 1824. In that year the act was renewed, but previously the convention had been extended for ten years in consideration, partly, of arrangements relating to fishing privileges.

Mr. Roberts' intimation that *fear* of England caused the reciprocity convention to be made is not true. Emerson says, "They who are in evil and falsehood are afraid of all others." The legislation of 1817, 1818 and 1820 shows Congress had no fear whatever of England. In 1817 we prohibited foreign vessels from our domestic shipping trade, and excluded from our ports all vessels of foreign flags coming with cargoes from countries *not that of the vessel.* In 1818 we prohibited the entry of vessels of any nation from ports anywhere that were closed to our ships, and in 1820 reinforced the act of 1818. In consequence of this legislation, *highly protective* of our vessels, British commerce with us in their own vessels fell off immensely. They did not declare war, but for twelve years suffered great losses, and in 1830 yielded to common sense and to our policy.

Mr. Roberts says (page 30):

"Let it be known that this 'policy of the fathers,' even if reverted to, cannot cope successfully with present-day conditions. This practice consisted in remitting 10 per cent of the tariff duties upon goods imported in American bottoms."

This was only a small part of the protection and was true for a few years only. Since 1794 the "10 per cent" was not a rebate, but an extra duty on all goods by *foreign* vessels. He seems ignorant of the double duties on goods indirect or by foreign ships from the East Indies and China; and the discriminating tonnage dues—the differential at first being forty-four cents, but after 1804, ninety-four cents.

He says, "the inducement (of 10 per cent) led only to ships on the homeward trip; that is, one way." But what was the discriminative tonnage duty for? Evidently, that handicapped the foreign ship right in our own ports, and was intended to disenable her to underbid our ships for freights outward. The tariff duty protected inward, the tonnage duty protected outward. Thus the system worked *both ways*.

Mr. Roberts says, "subsidy works both ways," and he goes on to assume that advocates of the constitutional policy are without ability to apply their principle with success. He thinks non-dutiable imports would knock out the method that no discrimination could be made! What is in the way of putting a duty upon goods by foreign vessels, but making them free of duty by our own ships?

He says, "A remission of tariff duties to the shipper is the equivalent of giving him that much money out of the Treasury, and is in reality a subsidy."

But suppose the differential is not a remission, but an *extra*—what is it then? All this was threshed out one hundred and sixteen years ago. As soon as our vessels carried over *half* of our own trade, Congress changed from remission of dues to charging *extra*.

All the subsidy argument is useless. Be it ever so true that subsidy would be a preferable method to discriminating duties, the fact—*the very cold fact*—remains, that, under the Constitution as it stands, subsidy is *impossible*. The Federal Government is under compact to pass and maintain "navigation laws" for ship encouragement. This system of law *stands* to-day with some exceptions. Wipe out these, and we are again where we were when the act of 1828 was passed. If we prefer subsidy, then agitate for an amendment of the Constitution.

"A little learning is a dangerous thing."

A Society of Nautical Antiquaries.

The editor of the PROCEEDINGS has received the following letter and circular relating to the establishment, which now seems assured, of a Society of Nautical Antiquaries. It is hoped that among the members of the Institute there will be many whose interest in the field to be covered by the proposed periodical will lead to their becoming subscribers.

5, RUVIGNY MANSIONS, PUTNEY, S. W.
2 April, 1910.

PROFESSOR P. R. ALGER, U. S. N.

DEAR SIR.—If you are sufficiently in sympathy with the scheme outlined in the enclosed circular to give it publicity in the PROCEEDINGS OF THE U. S. NAVAL INSTITUTE, I shall be very glad.

In the few days during which the project has been before the public in this country, promises of support have been coming in so freely that I think it almost safe by now to predict that it will shortly be possible to put the matter on a definite footing. The first steps would probably be

To call a founders' meeting and appoint the necessary officers.

To begin the publication of a monthly journal.

Of course, quite apart from the natural desire for the power which a wide membership would give, you will see how greatly the scheme would benefit by being extended to include antiquaries in all maritime countries. It is in the hope of securing for it this double benefit that I approach you on the subject. As far as I know, there is no such society existent in any country.

The British applicants of the first few days are drawn almost equally from the navy and from outside it. The naval officers are of all ranks, active and retired, from admiral to midshipman.

Yours truly,

L. G. CARR LAUGHTON.

PROPOSAL FOR THE FORMATION OF A SOCIETY OF NAUTICAL ANTIQUARIES.

Experience has shown that interest in nautical archæology is active and increasing. At present each individual student, whether his motive be historical, artistic, or purely antiquarian, must needs rely on his own unaided research: whence it appears that the provision of some means of intercommunication would be helpful. Of various suggestions made, that which seems to find most favor is for the foundation of a periodical wherein subscribers could record the results of their researches into, and bring forward points needing elucidation concerning such matters as the following: The design, building, and equipment of ships; the language and customs of the sea; iconography; genealogies; nautical flags, relics, medals, dress, and so forth. If after the establishment of a periodical it were thought desirable to proceed to the foundation of a society, the periodical would still be needed to serve as its official organ.

It is believed that the proposed society, or periodical, would serve as a useful, if humble, ally to the *Navy Records Society*, standing to it in the relationship which a pinnace bears to a great ship, and serving to make discoveries in narrow waters where she herself might not easily come.

In order to know what support might be expected, it is necessary to assume that the annual subscription would probably be fixed at one guinea; and to ask those who favor the project to communicate, as a preliminary measure with the acting secretary, Mr. L. G. Carr Laughton, 5 Ruvigny Mansions, Putney, S. W., London.

February, 1910.

PROFESSIONAL NOTES.

Prepared by Profesor PHILIP R. ALGER, U. S. Navy.

SHIPS OF WAR, BUDGETS AND PERSONNEL.

ARGENTINE REPUBLIC.

The following were the principal tenders for the Argentine battleships:

1. Fore River, United States, a ship of 27,900 tons; speed 22.5 knots; 12-inch armor; at the price of £2,190,000; delivered in from 24 to 27 months (whose tender has since been accepted).

2. Ansaldo, Italy, a ship of 25,600 tons; speed 22 knots; 10-inch armor; price £2,200,000; delivered in from 24 to 28 months.

3. Forges & Chantiers, France, a ship of 25,170 tons; speed 22 knots; 10-inch armor; price £2,200,000; delivered in 29 months.

4. Armstrong & Vickers, England (four proposals), ships of 29,060 and 28,040 tons each; speed 24 and 22 knots; 12-inch armor; prices £2,500,750 and £2,450,750 respectively; delivered in 33 months.

5. Blohm & Voss, Germany (three proposals), a ship of 25,900 tons; speed 22.5 knots; 12-inch armor; price £2,304,000; delivered in 30 months.

The type of engines proposed by Fore River was Curtiss or Parsons; all the others offered Parsons, which is the class desired by the Argentine Government. The prices of the different contractors, work out as follows: American, £78.3 per ton; Italian, £85.9 per ton; English, £86.3 per ton; French, £87.4 per ton; German, £88.2 per ton.

Captain Capeola, Secretary of the Argentine Naval Commission, is reported as saying that the reason why the contracts for the two Argentine battleships were awarded to the Fore River Company is that better ships can be obtained for the price in the United States than in England. "The reason why the United States tender was lower than the English," he is reported to have said, "is that steel for construction work and armor-plating is a great deal cheaper in the United States than in England. Wages are higher there, but the contractors will save a considerable amount on the steel, and are able to obtain it more cheaply owing to the manipulations of the Steel Trust."—*Page's Weekly.*

The following particulars of the Fore River design, taken from *The Standard*, of Buenos Ayres, will be of interest: The main armor belt will extend for 250 feet in the center, and 4 feet 9 inches above and 3 feet 4 inches under the normal water line, the uniform thickness being 12 inches. The armored band will extend 75 feet toward poop and bow to the barbettes, but with the thickness of 10 inches only. Above the principal belt of armor for the whole length of 400 feet there will be armor of 9 inches in the lower part and 8 inches in the upper part to the height of the main deck. The bow and poop will also be protected by armor of 6 and 4 inches respectively. On the main deck there will be a casemate with armor of 6 inches, in which the 6-inch guns will be placed. The bases of the chimneys will be protected to 15 feet from the deck with a special steel plate 1½ inch thick. The total weight of the armor, barbettes, turrets, etc., will be 7000 tons. The bottom of the ship will be protected against submarine mines with 660 tons of nickel steel. The turbine engines will be in three separate and independent compartments, and the boilers will be in six compartments, divided into two groups. The capacity of the coal-bunkers is 4000 tons and there will be tanks for 660 tons of petroleum. The turbines will

develop 39,500 horsepower with 25 millimeters of pressure of air in the boilers. This, with a displacement of 27,500 tons, will give a speed of 22½ miles an hour for eight successive hours. With this speed, the radius of action will be 3600 miles; at a speed of 15 miles the radius will be 7200, and with 11 miles an hour 10,100 miles. The cost of each ship will be $11,000,000.—*Scientific American.*

AUSTRIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Radetsky	14,500	Trieste.	Launched July 3, 1909.
Zrinyi	14,500	"	" April 12, 1910.
Erzherzog Franz Ferdinand.	14,500	"	Under trial.
Scout.			
Admiral Spaun	3,500	Pola.	Under trial.

With the launch of the *Zrinyi*, which also took place at the Stabilimento Tecnico, Trieste, on April 12, the last of the three ships of the *Franz Ferdinand* class is in the water. These ships, on their displacement of 14,226 tons, carry four 12-inch guns and eight 9.4-inch, all of 45 calibers. They are not *Dreadnoughts*, but mark a further stage in the advance of the Austro-Hungarian Navy towards the goal, to which so many are wishful to urge it, to become the equal of the navy of any other great Power. The keen interest of the heir apparent in the navy, the example which the German Emperor has set, and the manifest need of a fleet in view of the ambitions of the country, make it probable that the Dual Monarchy will soon enter upon a vigorous naval policy. It is generally known that the resources of the Stabilimento Tecnico have been increased, that the Skoda factory has 12-inch guns under trial of 50 caliber type, if not still more powerful weapons, and that the Poldihütte and Witkowitz companies are quite capable of supplying armor on the required scale. A strong propaganda is on foot for naval expansion, and many agencies are at work to stimulate public opinion. We know how anti-English feeling was used to bring about the creation of the present German Navy. In Austria the cry is against Italy, and the plea that Austria must become the dominating naval power in the Adriatic. No doubt the position of Italy in the Triple Alliance makes the application of this stimulus somewhat difficult, but the "Dervishes," as the scare-mongers are called, are employing it.—*Army and Navy Gazette.*

"The Zeit" reports from Pola that the speed trials of the *Erzherzog Franz Ferdinand*, the first of the *Radetzky* class, resulted in an average of 20.58 knots with 20,600 indicated horsepower. The contract prescribed 20,000 indicated horsepower and a maximum speed of 20.3 knots. The *Franz Ferdinand* is not fitted with turbines.

BRAZIL.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Rio de Janeiro	19,250	Elswick.	Building.
Sao Paulo.	19,250	Vickers.	Under trial.
Scouts.			
Bahia	3,500	Elswick.	Under trial.
Rio Grande	3,500	"	" "

The two Elswick-built scouts, *Bahia* and *Rio Grande*, have been delivered to the Brazilian Government. Both vessels exceeded 27 knots, the Rio Grande attaining no less than 27.4 knots on her official trials. This is a remarkable result for a 3000-ton vessel of 380 feet length.

FRANCE.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Danton	18,350	Brest.	Launched July 4, 1909.
Mirabeau	18,350	Lorient.	" Oct. 28, 1909.
Voltaire	18,350	Bordeaux.	" Jan. 16, 1909.
Diderot	18,350	St. Nazaire.	" Apr. 19, 1909.
Condorcet	18,350	"	" Apr. 20, 1909.
Vergniaud	18,350	La Seyne.	" Apr. 12, 1910.
Courbet	23,500	Lorient.	Ordered
Jean Bart	23,500	Brest	"
Armored Cruisers.			
Edgard Quinet	13,644	Brest.	Launched Sept. 21, 1907.
Waldeck-Rousseau	13,644	Lorient.	" Mar. 4, 1908.

The organic law for the reorganization of the French Navy has at last taken shape in the form of a bill which has been presented to the Chambers. The object is to provide for ordered development on the lines of the German Navy Law, and an establishment of ships is to be fixed, with an age clause to regulate the date of replacement. Within the last 20 years the Superior Council of the Navy has been consulted nine times with reference to the composition to be given to the fleet. In 1889 it thought that the strength should be that of the German, Italian and Austrian fleets combined. In the next year a "decennial program" was to provide 24 battleships and 36 cruisers, of which 12 of the first class, besides coast defence vessels, and a considerable force for foreign service. In 1894 the council eliminated the coast defence vessels from the program, and two years later the whole scheme was revised. The intention then was to have 24 battleships and four as a reserve, 12 armored cruisers, 30 destroyers, and 30 sea-going torpedo boats, as well as some reserve ships, ships for abroad, and certain coast defence flotillas. In 1898, 18 armored cruisers were proposed instead of 12, and in 1900 submarines were added. There was another modification in 1905, when the vessels in the program were 34 battleships, including four as a reserve (six of these to replace the old coast defence vessels), 18 first class and 18 second class cruisers, and a considerable number of scouts and torpedo craft.

The first consideration that presents itself is that none of these schemes has been seriously undertaken. The proposals that are now before the Chambers are more practical, and they have the great advantage of being presented in association with a plan of administrative reform which will, if carried out, place the dockyards on a much better footing and do much to encourage private builders. As in 1906, the fleet is to consist of 24 battleships and four as a reserve, the organization being in four squadrons of six ships each. The divisional unit of three ships, which has held its place in French organization for a century, is thus to be retained. This will be regretted by many officers, who recognize that the tactical conditions of modern times are better met by organizations of four ships. Each squadron will have attached to it two scouts and 12 destroyers, and two cruisers and four destroyers will form a reserve. Only two of the squadrons will be in full commission, the others having nucleus crews, as will be the case with the scouts and destroyers attached to them. So far as appears, the armored cruiser is eliminated from the new organization, except for foreign service. The latter will require 10 ships, besides gunboats. The submarine flotillas are to comprise 94 boats, and there are to be four mine-layers, besides mine sweepers and other vessels. The age limit for battleships laid down before 1909 has been fixed at 25 years, and ships laid down before that date are to be superannuated after 20 years. Two of the vessels of the program are to be laid down each year in 1910, 1911, and 1912.—*Army and Navy Gazette.*

Admiral de Lapeyrère has just taken, concerning the 23,467-ton battleships of the 1910 program, a series of decisions which have caused general satisfaction in the service. He has placed important credits at the disposal of the Brest and L'Orient Préfets maritimes in order to press forward the construction in hand (*Danton, Mirabeau, Rousseau, Quinet*), and to complete all preliminary preparations, and has awarded contracts for material to the extent of four million francs. Tenders have been called in for guns, armor, and motors, and contracts will be shortly awarded, though a good part of this work is to be entrusted to State establishments. The decision of the Admiralty on the question of the boilers is awaited with considerable interest in view of the declarations the Minister of Marine has made in Parliament. The foresight and methodical activity thus displayed in high quarters justify the belief that by the summer of 1913 we shall see flying the tricolor both the *Jean Bart* and the *Courbet*, as the new cuirassés have been named. They had up to the present been spoken of under the ridiculous appellations of *Dumas* and *Molière*, which excited universal contempt in the service, and gave rise to the biting sarcasm of "John Frog" in *Vie Maritime*. What French naval men have all along wanted for their warships is a nomenclature similar to the English, that is naval and national, of noble gratitude and admiration towards past heroes, and at the same time calculated to firmly impress on the mind of young seamen the raison d'être of their career, which is to defend their country with the same fearlessness and the same devotion as were displayed by the brave men whose examples are recorded in golden letters at the poop of their ships. *Jean Bart* and *Admiral Courbet*, selected by Admiral de Lapeyrère for the first battleships he has ordered, answer all desiderata. They offer the twofold advantage of commemorating renowned commanders who have done honor to their country, and of perpetuating names already in the service. The last *Jean Bart* was a protected cruiser of 4000 tons, which was wrecked two years since on the coast of Morocco, and as to the *Courbet*, now at Brest used as barracks, she is a 10,500-ton battleship, launched in 1881, which presents the peculiarity with her sister ship *Devastation* to have been the only partially belted cuirassés in the service. This choice shows that devotion to duty and military virtues are henceforth to be the only attainments celebrated in the Gallic naval nomenclature.—*Naval and Military Record.*

THE FRENCH NAVY LAW.—Admiral Boué de Lapeyrère is certainly the most remarkable naval administrator whom France has seen for many a long day. His various reforms touch every branch of the naval service and every department of naval thought, and though they are yet no more than schemes they are in a fair way to become realities. Like some naval reforms in this country, they are the subject of much comment, some of it adverse, and there are differences of opinion such as exist in all navies on subjects which are, nevertheless, of very critical importance. This is fully recognized by the Minister, who, in a pregnant passage of his Memorandum, says that the inevitable diversity of opinion that exists in conceptions of naval strategy and the conditions of naval warfare render it particularly necessary that the sovereign authority of the law should be exerted to give "to programs of construction and service the stability and continuity that are indispensable." He looks back, no doubt, to the theories of the "Jeune École," to the wild ideas of M. Pelletan, and to other influences which have had so disastrous an effect on the French Navy. Here we have the object and genesis of the new organic law, which is a measure whose high naval and political importance has scarcely yet been recognized in this country. Its naval importance proceeds from the resolution it embodies to give to naval development that direct and continuous force which have been referred to. The political importance of the scheme lies in the definite relation in which it places the French Navy with regard to other navies.

It is impossible to conceive that so zealous a Minister as Admiral de

Lapeyrère can have presented to the legislature without bitter regret a measure which will place France in a position of recognized inferiority as compared with Germany, and which will leave her powerless unaided to resist the naval objects of that country. Obviously this is a concern of more nations than one. We are far from wishing to imply that the French Minister is not adopting the wisest course, and, perhaps, the only course in the circumstances, and possibly he has done so under assurances of a political order. Be this as it may, he is prepared to propose to France a fleet establishment of 28 battleships only, as compared with the 38 of Germany.

It must be observed that the French have adopted the formation of squadrons of six vessels—perhaps they have been helped to that decision by financial considerations also—though many French officers regard four battleships as the right divisional unit, as in the British and German Navies. It deserves also to be noticed that the armored cruiser disappears from the organization. No more vessels of the class will be built, and those which exist will be employed with the squadrons as scouting vessels, or will be sent to foreign stations. It is thus arranged that none of the scouts shall be laid down until 1917, when two will be required to replace the *Marseillaise* and *Jurien de la Gravière*. In all six scouts will be required to replace vessels which become obsolete, and, of course, the process will go on in subsequent years. The situation with regard to battleships is different, it being necessary to build six additional ships and to replace 10 others, making a program of 16 in all. On January 1, 1919, only the six *Patries* and the six *Dantons*, with the *Suffren*, will remain available under the age clauses, and the last-named vessel will require to be replaced in that year. Similar arrangements are made for the other classes of vessels, which are shown below.

The following is the scheme for laying down additional ships and others for replacement in the years covered by the organic law:

BATTLESHIPS: 1910—1 additional, 1 to replace the *Brennus;* 1911—2 additional; 1912—2 to replace the *Carnot* and *Charles Martel;* 1913—1 additional, 1 to replace the *Jauréquiberry;* 1914—2 to replace the *Bouvet* and *Masséna;* 1915—2 to replace the *Charlemagne* and *St. Louis;* 1916—2 additional; 1917—1 to replace the *Gaulois;* 1918—none; 1919—1 to replace the *Suffren*. Total, 6 additional, 10 for replacement.

SCOUTS: 1910-1916—*none;* 1917—2 to replace the *Marseillaise* and *Jurien de la Gravière;* 1918—2 to replace the *Jules Ferry* and *Amiral Aube;* 1919—2 to replace the *Victor Hugo* and *Léon Gambetta*. Total, 6 for replacement.

DESTROYERS: 1910—8 additional; 1911—none; 1912—3 to replace *Baliste, Bélier, Arquebuse;* 1913-1914—none; 1915—2 to replace *Claymore* and *Obusier;* 1916—none; 1917—3 to replace *Pierrier, Stylet, Tromblon;* 1918—none; 1919—4 to replace *Carquois, Trident, Mortier* and *Fleuret*. Total, 8 additional, 12 for replacement.

VESSELS FOR FOREIGN STATIONS: 1910-1919—None.

SUBMARINES: 1910—1 of 700 tons, additional; 1911—1 of same class; 1912—1 (400 tons), 3 (700 tons) additional, and 6 to replace the *Français, Algérien, Follet, Castor, Loutre, Soufflеur;* 1913—4 (700 tons) additional; 1914—4 (700 tons) additional; 1915—3 (700 tons) additional, and 3 to replace *Dorade, Otarie, Phoque;* 1916—2 (700 tons) additional, 3 to replace *Méduse, Ludion, Naiade;* 1917—7 to replace the *Bonite, Thon, Oursin, Truite, Alose, Anguille, Grondin;* 1918—8 to replace *Sirène, Triton, Silure, Espadon, Aigrette, Cigogne, Emeraude, X;* 1919—4 to replace *Opale, Rubis, Oméga, Saphir*. Total, 19 additional and 31 for replacement.

COMPLETION OF VESSELS FOR SERVICE UP TO 1919.

BATTLESHIPS: 1910, 1911—None; 1912—6 *Dantons* (additional to the program); 1913 to 1919—2 each year.

SCOUTS: None before 1919.

DESTROYERS: 1910, 1911—None; 1912—8; 1913—None; 1914—3; 1915, 1916—None; 1917—2; 1918—None; 1919—4.

SUBMARINES: 1910—11; 1911—12; 1912—8; 1913—1; 1914—10; 1915—4; 1916—4; 1917—6; 1918—5; 1919—7.

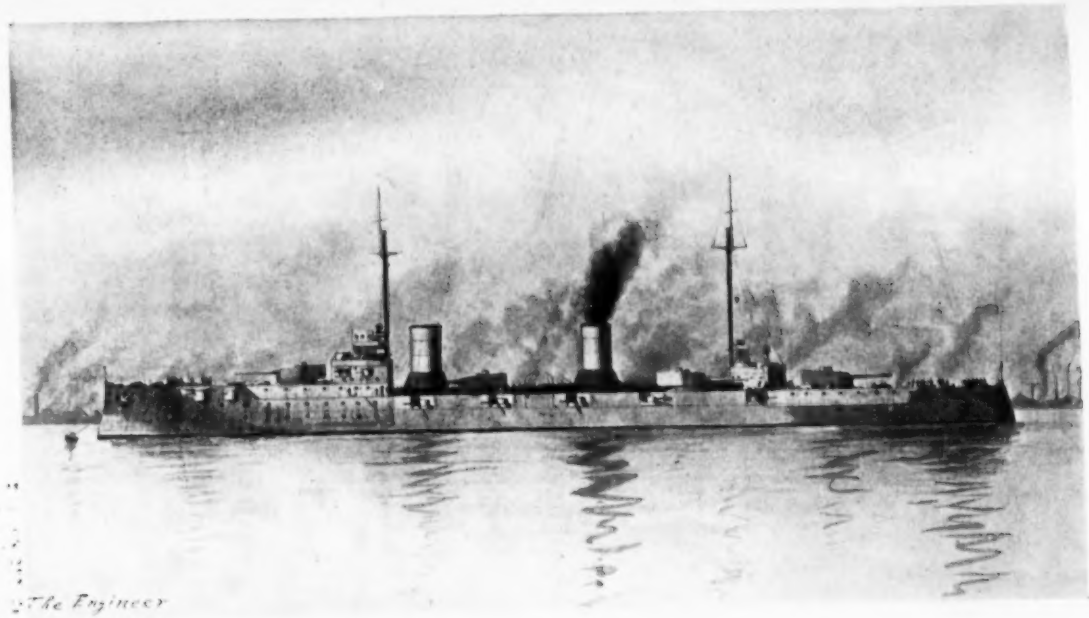
Establishment to be reached in 1919, taking account of the obsolete vessels to be replaced and the additional vessels to be provided: Battleships, 28; scouts, or vessels accounted as such, 10; seagoing destroyers, 52; vessels for foreign stations, 10; coast-defence destroyers, 45; submarines, 94. —*Army and Navy Gazette.*

THE NAVAL MANEUVERS.—Very great interest is attached to the forthcoming maneuvers of the French fleet. The period of strained relations will begin on May 15, but the outbreak of hostilities will be determined by the Minister, and the maneuvers will conclude on June 15. Admiral Caillard will have his flag in the *Victor Hugo*, and four flag officers have been chosen as umpires, and are expected to embark in the battleships of the four several divisions. These are Vice-Admiral Kiésel and Rear-Admirals Perrin, Richard-Foy and Gauchet. It is intended that the student officers at the Superior Naval School shall embark in certain of the vessels, and that their technical professor, Capt. Ratyé, shall be afloat also. The Minister of Marine proposes to embark as a spectator in one of the ships, leaving complete liberty of initiative to Admiral Caillard. In addition to the two main squadrons, all the flotillas in the Mediterranean, the fixed defences, and the coast-guard services in France, Algeria, Tunis and Corsica will be mobilized. The first squadron, under the command of Vice-Admiral de Jonquières, is at Toulon, while the second squadron, under command of Vice-Admiral Aubert, will proceed to the Mediterranean from the northern ports.—*Army and Navy Gazette.*

GERMANY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Rheinland	18,500	Stettin (Vulkan).	Under trial.
Posen	18,500	Kiel (Germania).	" "
Ost Friesland	21,000	Wilhelmshaven.	Launched Sept. 30, 1909.
Thüringen	21,000	Bremen (Weser Yard).	" Nov. 27, 1909.
Helgoland	21,000	Kiel (Howaldt).	" Sept. 26, 1909.
Ersatz Frithjof	22,000	Danzig (Schichau).	Building.
" Hildebrand	22,000	Kiel (Kaiserliche W.).	"
" Heimdall	22,000	Hamburg, (Vulkan).	"
" Hagen	.....	Kiel (Howaldt).	Ordered.
" Aegir	.....	Danzig (Schichau).	"
" Odin	.....	Kiel (Germania).	"
Armored Cruisers.			
Von Der Tann	19,000	Hamburg (Blohm and Voss).	Under trial.
Moltke	21,500	Do.	Launched April 7, 1910.
H	21,500	Do.	Building
J	21,500	Do.	Ordered.
Protected Cruisers.			
Kolberg	4,300	Danzig.	Under trial.
Koeln	4,500	Kiel.	" "
Augsburg	4,500	"	Launched July 10, 1909.
Ersatz Falke	5,500 ?	Bremen (Weser).	Building.
" Bussard	5,500 ?	Stettin (Vulkan).	"
" Cormoran	5,500 ?	Bremen (Weser).	Ordered.
" Condor	5,500 ?	Wilhelmshaven.	"



THE GERMAN FIRST-CLASS CRUISER "VON DER TANN"

THE "VON DER TANN."—With the possible exception of the *Dreadnought* no warship has ever excited so much interest and curiosity as the German cruiser *Von der Tann*, of which we give an illustration. This picture shows the ship in her present state. She is not yet absolutely complete, as will be noticed from the absence of boats. It is not quite clear yet how and where she will carry her boats, but, presumably, they will be stacked about the funnels. Much of the interest attaching to the *Von der Tann* is due to the secrecy which has been observed concerning her, and the various armaments with which she has been credited. Also interesting is the fact that she is Germany's first attempt at what is known as a "*Dreadnought* cruiser."

The total armament of the vessel is as follows: Eight 11-inch, 45 calibers; ten 6-inch, 45 calibers; sixteen 20-pounders; three submerged torpedo tubes. The 6-inch guns are carried in a central battery amidships with the usual German type of gun port, recessed in order to admit of a wider angle of fire. It is noteworthy that no provision whatever is made for ahead fire with the forward 6-inch guns. This absence of ahead fire is probably copied from our *Duke of Edinburgh* class, in which it was found that main deck guns could not be satisfactorily mounted with the sides cut away for end-on fire. The after 6-inch of the *Von der Tann* can, as in the *Duke of Edinburgh*, fire right aft. The 20-pounders are mounted as follows: Four in the forecastle, four inside of the superstructure below the bridge and conning tower, four on top of the after superstructure, and four on the main deck right aft.

Nothing is definitely known as to the exact thickness of the *Von der Tann's* armor. The maximum thickness of the belt does not, however, probably exceed 6 inches, and the armor on the battery is probably thinner. The belt extends from the bow to within about 20 feet of the stern, which is unarmored. The normal displacement of the *Von der Tann* is 18,700 tons, the full load displacement 19,500. She is 558 feet long, with a beam of 85 feet and a mean draft of about 27 feet. The horsepower is 45,000, and the designed speed 25 knots. This designed speed of 25 knots is likely to be greatly exceeded. The *Blücher* reached a maximum of three knots over her designed speed, and it may be reckoned that the *Von der Tann* will certainly touch 27 knots, if not more.* She is fitted with Parsons turbines, driving four screws. The boilers are of the Schulz-Thornycroft type, as fitted to all German warships.

The *Von der Tann* was built by Messrs. Blohm & Voss, of Hamburg. She was laid down in October, 1907, and was to have been completed last December. Her completion, however, has been delayed, and she has only just begun her preliminary trials.—*The Engineer.*

As a contribution to the great naval question of the day, the *Norddeutsche Zeitung* publishes some interesting tables and figures in order to make manifest that Germany cannot have more than 13 *Dreadnoughts* built by the end of 1912, and that there is no possibility of her possessing by then the 17 *Dreadnoughts* which Mr. McKenna calculated upon when dealing with the matter last spring. There is one important point made clear, and that is that the average rate of construction for the German *Dreadnoughts* has so far not been two years or anything like it, but has, instead, reached an average of rather more than three years.

As bearing out this term of construction the *North-German Gazette* says: "In Germany the date of the official order, or of the effective order, depends upon the voting by the legislature of the first instalment for the construction of a vessel—that is to say, in point of time coincides with the beginning of the financial year for which the vote is made. The placing of the official order for a new ship before April 1 would conflict with legal provisions, and is therefore not possible. If, therefore, the giving of the effective order is not delayed by circumstances—considerations as to plans,

* It is reported that she has made 28 knots.—P. R. A.

delay in the conclusion of the debates in the Reichstag, or negotiations with the yards—the effective order is given in April of the year of the vote, and the beginning of the construction must be reckoned as from this date." This has reference to Mr. McKenna's speech on the Navy Estimates in March last, when he declared that: "In August, 1907, four German *Dreadnoughts* were laid down. . . . . We know that from the date of the official order or the date of laying down the ship there are two years and two months to completion."

Apparently the periods assigned by Mr. McKenna have not been arrived at by a correct process of calculation, as in the tabular statement published by the *North-German Gazette*, the figures are set out as follows:

Nassau, voted, 1906; ordered, May 31, 1906; commissioned, October 1, 1909; period of construction, 40 months.

Westfalen, voted, 1906; ordered, October 30, 1906; commissioned, November 16, 1909; period of construction, 37 months.

Rheinland, voted, 1907; ordered, April 2, 1907; "contemplated" date of commissioning for trials, May, 1910; period of construction, 37 months.

Posen, voted, 1907; ordered, April 2, 1907; "contemplated" date of commissioning for trials, April, 1910; period of construction, 36 months. —*United Service Gazette.*

With regard to the German Navy it is not always realized that its development depends not so much upon the capacity of the constructing yards nor even upon that of the Krupp Works as upon the financial provision made by the German Government. The financial year 1910 having begun, the naval authorities are making arrangements with regard to the distribution of the contracts. Messrs. Blohm and Voss, of Hamburg, who have built all the cruiser battleships, are to lay down the vessel designated by the letter "J," and the three battleships will be distributed among the other yards, while the small cruiser *Ersatz Cormoran* will be built by the Weser Yard at Bremen. It seems important to observe that it is perfectly possible for Germany to accelerate the work, if that were necessary, and if the money were made available. The German program is perfectly explicit, and provides for a definite number of ships. The building facilities are at present far greater than the demand, and certain of the yards have not been provided with work, while it has been difficult to keep the men of the dockyards fully employed. The private shipbuilding yards will naturally anticipate construction in order to keep together their staff of skilled workmen, and this is the explanation of a good deal of the acceleration that has aroused so much comment. Upon this subject there has been a good deal of misapprehension. The shipbuilding resources of Germany have increased enormously, and, indeed, out of proportion to the requirements of the country, which is an industrial fact of very great importance now occupying much attention in German shipbuilding centers.—*Army and Navy Gazette.*

ACCIDENTS TO DESTROYERS.—The German destroyer flotilla, which has recently been maneuvering off Sassnitz, has met with a series of those accidents that are almost unpreventable if torpedo-boat destroyers are to practice in peace time what they will inevitably have to do in war time. *S 140* and *147* have both had serious troubles involving loss of life through bursting boiler tubes, and two of the *S 120* class collided at high speed the week before and killed several men. One of the latter boats was so badly damaged that she nearly sank. It might be noted that the *S 120* class of six boats have always been unlucky. *S 124* was sunk some years ago, but has since been raised.—*The Engineer.*

THE GERMAN FLEET IN THE NORTH SEA.—The official date for the transfer of the first squadron of the High Sea Fleet from Kiel to Wilhelmshaven was announced some time ago. The great extension of the dock-

yard at the latter place, and the increase of its resources, has been in progress for many years, in anticipation of the change which has just taken place. It is well understood that the fleet will gain much wider experience in the North Sea than it could in the smoother waters of the Baltic. It is the opinion of the *Weser Zeitung* that a serious danger has been removed, because an enemy might have blockaded the Jade, and after destroying the forts at the mouth of the Weser and Elbe might have inflicted enormous damage upon Bremen and Hamburg before the squadron could have got through the Kiel canal. Upon this question it is permissible to feel some doubt. As to the first squadron, the *Westfalen* is to be the flagship, and the other vessels will be the *Nassau, Schlesien, Hannover, Zähringen, Wettin, Mecklenburg,* and *Wittlesbach,* with the small cruiser *Blitz.—Army and Navy Gazette.*

GREAT BRITAIN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Neptune	20,250	Portsmouth.	Launched Sept. 30. 1909.
Colossus	20,250	Scotts (Greenock).	" Apr. 9, 1910.
Hercules	20,250	Palmer's (Jarrow).	" May 10, 1910.
Orion	22,500	Portsmouth.	Building.
Monarch	22,500	Armstrong.	"
Conqueror	22,500	Beardmore.	"
Thunderer	22,500	London (Thames Iron Works).	"
Armored Cruisers.			
Indefatigable	18,000	Devonport.	Launched Oct. 28, 1909.
Lion	26,350	"	Building.
Princess Royal	26,350	Vickers.	"
	18,800	Brown & Co.	Ordered.
	18,800	Fairfield.	"
Cruisers.			
Blanche	3,400	Pembroke.	Launched Oct. 27. 1909.
Blonde	3,500	"	Building.
B-5	3,500	"	Ordered.
B-6	3,500	"	"
Liverpool	4,800	Vickers.	Launched Oct. 30, 1909.
8 (Dartmouth)	5,000	"	Ordered.
Bristol	4,800	Brown & Co.	Launched Feb. 23, 1910.
Gloucester	4,800	Beardmore.	Launched Oct. 28, 1909.
9 (Falmouth)	5,000	"	Ordered.
Newcastle	4,800	Armstrong.	Under trial.
10 (Weymouth)	5,000	"	Ordered.
Glasgow	4,800	Fairfield.	Launched Sept. 30, 1909.
11 (Yarmouth)	5,000	London & Glasgow Co.	Ordered.

POINTS FROM THE FIRST LORD'S STATEMENT EXPLANATORY OF THE NAVY ESTIMATES, 1910-1911.—The estimates for 1910-11 amount to £40,603,700, as compared with £35,142,700 for the current year. The numbers required for manning the fleet are 3000 more than were asked for in the estimates for the current year. This increase is due in part to a revision of the scheme of complement of ships of war and in part to the requirements of new ships.

The shipbuilding and armament votes together show a very large increase of over five millions, caused almost entirely by the increase in the shipbuilding program approved by Parliament last year. There is also a fresh charge owing to the beginning of the manufacture of torpedoes at the new factory at Greenock.

Shipbuilding.—New construction for the year will cost £13,279,830, as against £8,885,194 for 1909-10. Of this amount £11,850,790 will be spent on the continuation of work on ships already under construction, and £1,429,040 for beginning work on ships of the new program, which is composed as follows: 5 large armored ships; 5 protected cruisers; 20 destroyers, and a number of submarine boats estimated to cost a sum of three-quarters of a million pounds in all.

Between April 1, 1909, and March 31, 1910, the following ships will have been completed and become available for service: Five battleships, viz., the *Temeraire, Collingwood, St. Vincent, Superb* and *Vanguard;* two unarmored cruisers, the *Boadicea* and *Bellona;* nine destroyers, viz., six ocean-going vessels of the *Tribal* class, the large experimental ship *Swift,* and the two *River* class vessels purchased from Messrs. Cammell, Laird & Co.; six first-class torpedo-boats (coastal destroyer type); and sixteen submarines.

On April 1, 1910, there will be under construction: Seven battleships, three armored cruisers, nine protected cruisers, two unarmored cruisers, thirty-seven torpedo-boat destroyers, and nine submarines. Of these the following are expected to be completed by the end of the financial year 1910-11: A battleship, an armored cruiser, and an unarmored cruiser, five protected cruisers, twenty destroyers, and four submarines.

Provision was made in Navy Estimates 1909-10 under the ordnance vote, for work in connection with aerial navigation, and important experiments have been carried out by the recently-formed Aeronautical Branch. Officers, petty officers and men are now being trained in aeronautics under the direction of a captain. The design of an experimental airship has been completed, and a ship is now under construction. Satisfactory progress is being made, and it is expected that this ship will be completed and ready for trials in the summer of this year, when a large number of experiments will be made to test the value of this vessel under all practical conditions.

After careful enquiry as to the best means of meeting the docking requirements of the immediate future, two large floating docks, capable of taking any war vessel now building or likely to be designed, have been ordered, and will be completed during 1911. It is intended to station them, one at Portsmouth and the other in the Medway.

Administration.—In development of the arrangements for preparation for war, the Naval Intelligence Department has been reorganized, a new department—the Naval Mobilization Department—being formed, and a permanent body, termed the Navy War Council, has been established at the Admiralty. The Council consists of the First Sea Lord as president, the Director of Naval Intelligence, the Director of Naval Mobilization, and the Assistant Secretary of the Admiralty, the latter acting also as Secretary of the Council. The head of the Naval War College attends and acts as member of the Council when the business is such as requires his presence, and other responsible officers will be called in to assist and advise when required. The Naval Mobilization Department, in addition to other duties, has taken over so much of the work of the Naval Intelligence Department as related to the mobilization of men and material.

The committee appointed last year to enquire into the Naval Medical Service has submitted a most valuable report, and their recommendations, some of which are of the greatest importance and of far-reaching scope, are at present receiving the detailed consideration of the Board of Admiralty.

A modification has been made in the Hydrographic Department with a view to ensuring that the department shall be able to command the services of officers with recent experience in the navigation of fleets. The Superintendent of Sailing Directions has therefore been replaced by a new Assistant Hydrographer. In future one of the Assistant Hydrographers will be an officer who has done surveying work at sea, and the other an officer who has had recent experience of the navigation and command of ships in a large fleet.

In view of the higher educational standards now reached by the men of the Royal Navy, particularly in certain classes, it has been found necessary to make considerable improvements in the pay and prospects of naval schoolmasters. Amongst other advantages the proportion of commissioned warrant officers and warrant officers allowed to this branch has been increased, the relative rank of lieutenant will be obtainable by chief schoolmasters on retirement, and an improved rate of pay has been established. The scales of pensions for the widows, and of compassionate allowances for the children, of chief and head schoolmasters have also been improved.

The rapid growth of the B Division of the Royal Fleet Reserve, composed of men who have left the active service at the end of their first engagement of 12 years or earlier, has given rise to a large demand for places to be found for its members in civil employment. A three-year agreement has been entered into with the Navy Employment Agency, which undertakes, in consideration of a grant of £1000 per annum, the organization of special "labor exchange" work on behalf of Fleet Reserve men all over the country.

Personnel.—Improvements have been made in the scale of retired pay for officers of the military branch, as a temporary measure, to enable the more senior officers of commander's and lieutenant's rank to retire on better terms than hitherto, and thereby to relieve the congestion on the commanders' and lieutenants' lists. Officers who avail themselves of these exceptional terms of retirement must undertake to place their services at the disposal of the Admiralty if required.

Arrangements for extending the number of naval ratings who are eligible for warrant rank have been completed and the following classes can now attain the position of warrant officer: Writers, ship's stewards, ship's police, ship's cooks. Warrant rank has also been introduced for the telegraphist branch, as was indicated two years ago when this class was established.

Works.—This year has seen the completion of a number of the large engineering works begun under the Naval Works Loan Acts, including the dockyard extension and large dock at Simon's Bay, the Colombo Dock, the dockyard extension and large dock at Hong Kong, the Malta breakwaters, and the enclosure of the Admiralty Harbor at Dover.

In connection with the Portsmouth lock scheme, for which the contract was let in July, 1908, it has now been decided to build adjacent to the lock a new dock capable of taking vessels of the largest size.

Royal Fleet Reserve.—The numbers of the Royal Fleet Reserve have risen during the year from 19,613 to 20,813, the distribution on December 31, 1909, being as follows:

	Class A.	Class B.	Total.
Seamen, etc.	3,359	7,695	11,054
Stokers	1,486	3,212	4,698
Marines	1,715	3,346	5,061
	6,560	14,253	20,813

It has been decided that in future all men in the Reserve shall be required to perform seven days' drill in each calendar year, the option of performing a double drill every alternate year being withdrawn. The new rule has been applicable immediately to all entries in the Reserve, and will apply to men already serving after December 31, 1910.

Royal Marines.—The numbers borne on March 31, 1910, will be about 16,300. There will also be about 1300 Royal Marines for Naval Bands.

The extension of employment of Royal Marine Officers in the fleet in various naval duties as well as in wireless telegraphy, etc., has made good progress; such extra work is generally appreciated by the officers themselves, and has considerably enhanced their value to the Navy.

The qualification of trained men in gunnery had become so general

among the non-commissioned officers and men of the Royal Marine Light Infantry that the distinctive non-substantive rating (T. M.) for Royal Marine Light Infantry has been abolished. All efficient Royal Marines are expected to maintain that standard.

The system of technical training for men about to leave the corps to prepare them for civil life, which was inaugurated at Eastney in 1908, continues to be productive of excellent results in obtaining highly paid employment for late Royal Marines as chauffeurs, electricians, and in ordinary trades. Under this system, at very little expense to the Crown, the men trained are fitted to cope with the difficulties of obtaining satisfactory employment after leaving the service.

Maneuvers.—Throughout the year the commanders-in-chief have carried out tactical and other exercises with the vessels under their orders. Combined exercises were carried out by the home and Atlantic fleets in the North of Scotland in April and May, 1909. The annual maneuvers were carried out at the end of June and beginning of July. In addition to the strategical exercise in which the home, Mediterranean and Atlantic fleets took part, torpedo-boat and submarine exercises were also carried out concurrently. Altogether 370 vessels were engaged. A collision in which the *Sappho* was badly damaged gave an interesting opportunity to one of the dockyards to show the celerity in repairing work which might be expected under war conditions.

Ordnance.—Satisfactory progress has been made in the manufacture and supply of guns. The 12-inch guns for the *St. Vincent* class were completed and supplied by the dates they were required by the shipbuilders. Further improvements in designs of projectiles have been effected, both as regards safety, effectiveness, and increased ranging powers. Measures have been taken during the year which it is hoped may ensure greater regularity of ballistics than was obtained under the old conditions. Satisfactory progress has been made in bringing the older types of 12-inch mountings up to modern requirements, and has resulted in increased accuracy of fire. All three ships of the *St. Vincent* class have satisfactorily carried out their gunnery trials.

Target Practice.—The annual tests of gunlayers and the battle practice were carried out in 1909 under conditions very similar to those in 1908, and the results show a further improvement. The rules for the tests of gunlayers have been revised for 1910, the same general principles being retained. The regulations for the battle practice of the fleet during 1910 have been modified so as to still further assimilate the conditions of this practice to those which may be expected to obtain in action.

Torpedoes, Mining, Etc.—The developments of the torpedo referred to last year have continued with most satisfactory results. Great attention has been devoted to the important work of mining and mine sweeping during the year, and satisfactory progress has been made in the development of all its branches. The mining service was exercised during the maneuvers.

Practically all ships have now been fitted with the latest pattern wireless telegraphy instalations, which are working satisfactorily. A number of important shore stations have been completed.

Inspection and Proof.—The assumption by the Admiralty of responsibility for all designs of naval ordnance and ordnance material has been found a distinct advantage. The arrangements for inspection at contractors' works and the control by the Admiralty of the inspection of projectiles and all steel for ordnance in the north of England is working satisfactorily. Steps are being taken to provide more suitable accommodation at Sheffield for "testing" work in this connection.

Ordnance and Torpedo Depots.—The new torpedo factory at Greenock and range at Loch Long will be occupied during the summer of 1910, and arrangements are in progress for the transfer of the torpedo factory men and their families at government expense from Woolwich to Greenock.

The new torpedo depot at Keyham has been opened. On April 1, 1909, the Admiralty took over from the War Department the conduct of the naval ordnance business at Hong Kong. At all the large depots at home and abroad the Admiralty now have direct control of naval ordnance duties.

Coals and Coaling.—Much organizing work has been done during the past year in connection with the arrangements for meeting fleet requirements promptly under all conditions. Progress is being made in the work of increasing the accommodation for coals, and in the provision of efficient coal-handling machinery.

Oil Fuel Tanks.—A large number of tanks have been completed and filled, and additional tanks have been arranged for, in order to keep pace with increased requirements consequent on the increase in the number of ships fitted to burn this description of fuel. The facilities for the supply of oil fuel by contract at a number of ports have also been considerably added to, particularly in the direction of taking advantage of the Scotch shale oil industry. The Admiralty tank steamer, *Petroleum*, has been remuneratively employed in freighting oil fuel. A stock of petrol for submarines has been laid down in Admiralty tanks and further tanks have been arranged for.

H. M. S. COLOSSUS.—With the launch of the *Colossus* on April 9, a notable addition was made to his Majesty's Navy. Like the *Neptune*, launched last September, and the *Hercules*, to be launched in May, the *Colossus* has a displacement of 20,250 tons, a length of 510 feet, a beam of 86 feet, and a speed of 21 knots. The propelling machinery will consist of Parsons turbines supplied with steam from Babcock boilers, the horsepower required being estimated at 25,000.

In gun power she will be superior to her forerunners. Thus the ten 12-inch guns with which this class of vessel is armed in the British Navy will have a length of 50 calibers in the *Colossus*, as against a length of 45 calibers in the first four *Dreadnoughts*. In this respect the design follows the precedent set in the *Vanguard*, *Collingwood*, *St. Vincent* and *Neptune*. In the arrangement of the guns, however, a noticeable departure has been made in the case of the *Neptune* and *Colossus*. Unlike the preceding vessels, in which only eight of the ten guns are available for a simultaneous broadside, the latest *Dreadnoughts* will be able to bring all ten guns into action in this position. To secure this, the increased length of deck has been turned to good account by placing the pair of midship barbettes en echelon. The three other barbettes are placed, as before, on the center line of the ship, one forward and two aft of the funnels. The secondary armament for repelling torpedo-obat attacks consists of sixteen 4.7-inch guns.* With regard to her armor plating, it is doubtful if there will be a reduction in weight, as suggested in recent discussions.—*The Engineer.*

Laid down on July 8 last year, H. M. S. *Colossus* is the first ship of the 1909-10 program to take the water. To have brought this large vessel to the launching stage within nine months of laying the keel is an achievement in which the builders—Messrs. Scott's Shipbuilding and Engineering Company, Ltd.—may feel justifiable pride.

The alterations introduced in the *Neptune* have resulted in the superstructure being split up into three pieces, which will be connected over the top of the midship turrets by fore and aft bridges, or a light hurricane deck. Probably some such arrangement in a modified form will also be present in the *Colossus*. It is stated that the usual fire controls will not be placed on the masts of either of these ships, but that firing will be controlled from a director position amidships. It is, however, by no means certain that, as

* Whether the secondary battery of these ships is twenty-4-inch guns, as in the case of the three preceding *Dreadnoughts* (*St. Vincent*, *Collingwood* and *Vanguard*) or has been altered to sixteen 4.7-inch guns, is uncertain but seems doubtful.—P. R. A.

far as it concerns the *Neptune*, this long-standing report is true. Probably the intention to adopt it, if the new director firing proved successful, was taken when the *Neptune* was in the early stages of building; but the *Neptune* is now well advanced, and the director firing is far from being out of the experimental stage.

The *Colossus* is the ninth battleship and the thirteenth armored ship of the *Dreadnought* type to be launched for the British Navy. She is to be completed by July, 1911. The total cost will probably work out to between £1,650,000 and £1,700,000.

Of the eight *Dreadnought* battleships already in the water, four have been built at Portsmouth—the *Dreadnought, Bellerophon, St. Vincent* and *Neptune;* two at Devonport—the *Temeraire* and the *Collingwood;* while the Armstrong and Vickers companies have completed respectively the *Superb* and the *Vanguard*. The following comparison is interesting:

	Length. ft.	Beam. ft.	Draft. ft.	Displ't. tons.
Dreadnought	490	82	26½	17,900
Superb	490	82	27	18,600
Temeraire	490	82	27	18,600
Bellerophon	490	82	27	18,600
Vanguard	500	84	27	19,250
Collingwood	500	84	27	19,250
St. Vincent	500	84	27	19,250
Neptune	510	86	27½	20,250
Colossus	510	86	27½	20,250

H. M. S. *Hercules* in point of construction will run the *Colossus* very close. Laid down at Jarrow three weeks after the latter vessel it is expected that she will be launched by Palmer's Shipbuilding and Iron Company on May 10.

The nominal displacement of H. M. S. *Vanguard* is 19,250 tons, but her actual displacement has proved to be very close upon 23,000 tons. It is considered that a corresponding ratio between nominal tonnage and actual displacement will be shown in the case of the other new ships of the group, the *Collingwood* and *St. Vincent.—Page's Weekly.*

The *Colossus* and *Hercules*, though rated as a different class in the Navy List, will, to all intents and purposes, be sisters to the *Neptune*. The *Orion, Monarch, Thunderer* and *Conqueror* will form an entirely separate class by themselves. The *Orion* class will have all their guns in the center line, two funnels and a single mast. The *Neptunes*, on the other hand, will have two masts, and their guns will not be all in the center line.—*The Engineer.*

PRINCESS ROYAL COMMENCED.—On May 2, at Messrs. Vickers, Maxim's yard, Barrow-in-Furness, the keel-plate was laid of the armored cruiser *Princess Royal*. The new warship will be the largest and fastest cruiser yet projected for our navy, and will cost close upon £2,000,000. Her length will be 700 feet over all; breadth, 88 feet 6 inches; and she will have a displacement of 26,300 tons, her indicated horsepower being 70,000. The contract stipulates that the *Princess Royal* shall be ready for commissioning in March, 1912.—*Naval and Military Record.*

The British Admiralty have placed the contracts for the two cruiser-battleships of the *Indefatigable* type for the governments of Australia and New Zealand. Under the colonial scheme of naval construction, Australia is to become responsible for the construction of one of the vessels just placed, three cruisers of the *Bristol* type—the exemplar ship of which type was launched in February—six torpedo-boat destroyers and a number of

submarines. Of the destroyers, three are at present under construction, one of which, the *Parramatta*, was launched February 9. These vessels will form an Australian "fleet unit," and will embody, when complete, a naval force far stronger than the Commonwealth thought of a few years ago. They will cost altogether about $20,000,000, and will involve an annual charge of $3,750,000. The "fleet unit" of Australia, as also that of New Zealand—for which three destroyers are already being built in home yards—will form an integral part of the British Navy, subject, under certain conditions, to orders and regulations similar to those applying to the British Navy.—*Army and Navy Journal.*

The two colonial cruisers have been ordered—one from the Fairfield Shipbuilding & Engineering Company, and the other from Messrs. John Brown & Co. They will have a displacement of 18,800 tons, with eight 12-inch guns and sixteen 4-inch quick-firers, and with turbine machinery of 44,000 shaft horsepower, to give a speed of 25 knots. The work on these two cruisers will be commenced at once, and will be pushed forward with all despatch, the date of completion being June of 1912.—*Engineering.*

THE TRIBAL CLASS OF DESTROYERS.—The torpedo-boat destroyer *Zulu*, which has recently been completed by Hawthorn, Leslie & Co., of Hebburn-on-Tyne, after undergoing her official trials, was commissioned at Chatham, on March 19, for service in the First Destroyer Flotilla.

The *Zulu* is one of the third batch of the *Tribal* class, of which a dozen have now been put afloat. These vessels of the 1907-8 program were not ordered until January, 1908, and they were not actually laid down until much later—the *Nubian* on May 18, the *Viking* on June 11, the *Crusader* on June 22, the *Maori* on August 6, and the *Zulu* on August 18. The *Zulu* was held up for practically the whole of 1908 owing to the strike on the northeast coast, and it was only on September 16 of last year that the vessel was launched. She has a length of 280 feet, a beam of 27 feet, a draft of 8 feet 10½ inches, and a displacement of 1030 tons. She has Parsons turbines of 15,500 shaft horsepower. There are three propellers. Steam is raised in Yarrow boilers burning oil fuel, of which 190 tons are carried. The armament comprises two 4-inch quick-firing guns and two 18-inch torpedo tubes. The vessel proceeded to sea on November 29 last for her first preliminary trial, when she attained the contract speed. Owing to adverse weather the official trial could not be carried out until December 28, on which occasion a speed of 33½ knots was easily reached in deep water, while the fuel consumption was well within the specified limit. The cruising trial of 24 hours' duration began the next day, and was carried through satisfactorily, the radius of action being fully 20 per cent over contract requirements.—*The Engineer.*

The torpedo-boat destroyer *Viking*, which has just been completed by Messrs. Palmer, attained 33.7 knots on her official trials. She recently completed very satisfactory gun trials off the mouth of the Tyne, and will be handed over to the Admiralty almost at once. She is somewhat remarkable in appearance, having six funnels, one to each boiler, and a curiously shaped stern, rather like that in the old Thornycroft 27-knotters.—*The Engineer.*

Mr. McKenna, replying to Mr. Middlemore, on April 13, said that the figures for completed high free-board destroyers were: United Kingdom, 46; Germany, 45. Counting from destroyer *S 90* onwards, the Germans have 42 more destroyers completed and 9 building; but it is not considered that these 42 can be classed as coming within the definition, or as capable of being used in the North Sea in a similar manner to the British destroyers mentioned. Besides the 46 completed British destroyers there are 37 building. The British and German destroyers over 400 tons completed were:

United Kingdom, 52; Germany, 63. He must, however, point out the futility of statistics based on the arbitrary selection of a particular figure of tonnage. For instance, the use of the words "over 400 tons" excluded 7 British destroyers which are exactly 400 tons. If he had taken an "over 300 tons" basis, the figures would have been: United Kingdom, 137; Germany, 87; or on an "over 500 tons" basis: United Kingdom, 46; Germany, 40; or on an "over 800 tons" basis; United Kingdom, 12; Germany, none.

THE TRUE REASON FOR BUILDING INVINCIBLES.—Mr. McKenna expressed regret that it was still incumbent upon Great Britain to build large armored cruisers with which to capture hostile vessels threatening British commerce, and that until enough of these cruisers were provided, the Admiralty would not be able to discontinue their construction.

The detailed drawings of the two unarmored cruisers to be laid down at Pembroke have not yet come to hand, but sufficient information to enable demands for some of the material to be used in their construction has been received. The vessels will, generally speaking, be of the same external form as the *Blanche*, *Blonde* and *Bellona*. As regards the portion of the ships to be occupied by the machinery spaces, they will be absolutely identical. This appears to suggest that the difficulty of providing additional boiler power has either been overcome or their Lordships have resolved to accept the original design with its incidental drawback in that respect, which is that the boiler installation is not such as to enable a head of steam adequate to permit of the vessels being continuously driven at full speed for a protracted run. This was made clear during the official steam trials of the *Bellona*, that vessel having attained a speed equivalent to about 27 knots per hour in the run on the measured mile, but was only able to average a fraction over 22 knots per hour during the eight consecutive hours' full-power trial. The diminution in speed was the result of decreased steam pressure, following blowing off, rendered necessary by too rapid production, due to the use of forcing expedients.

A change in form of the new vessels, as compared with the *Blanche* and *Blonde*, may be rendered necessary by a reversion to the practice of quartering the officers aft, instead of forward, as was done in the *Boadicea* and *Bellona*, and is proposed to be followed in the *Blanche* and *Blonde*. This change will bring the new ships into accord with general mercantile arrangement, and will restore to the quarter deck, as the after portion of the upper deck is usually termed, its old-time exclusiveness.—*Naval and Military Record.*

FUNNEL MARKINGS.—It looks as though the proverbial coach-and-four is already being driven through the new regulations for a fixed system of funnel marking for British warships. For some obscure reason, most British admirals violently object to having white rings on their funnels. The first objector is said to have been Admiral May, with the *Dreadnought*. On the grounds that there was nothing else in existence like the *Dreadnought*, this ship was allowed to go with plain funnels. The next ship to be without her funnel markings was the *Minotaur*, the flagship on the China station. The thin end of the wedge in her case was that she had no sister within 12,000 miles. It is now reported that a third flagship has found some reason for not carrying its distinctive marks, so that we seem to be well on the way back to the old chaotic system when funnel marks merely indicated the ship's temporary position in the squadron.

The suggestion to paint the funnels of all the ocean-going destroyers a black and white check, after the manner of the Spithead forts, is again to the fore. It is extraordinary how far these vessels can be seen and how large they appear in their black paint compared with the grey-painted cruisers. The difficulty, of course, is to keep the white check clean.—*The Engineer.*

An Admiralty letter just issued to the fleet introduces new procedure respecting the disrating of petty officers. It provides that in future a list of witnesses and summary of evidence in each case shall be recorded on a form provided for the purpose, on which the commanding officer is required to add his reasons for the decision at which he arrives. This system takes the place of the power hitherto held by commanding officers of the summary disrating of petty officers by warrant.—*United Service Gazette.*

DESTROYER'S BOWS.—The shape of the destroyer bows has undergone wide modifications of recent years. Nearly all the old "boats," as distinguished from "destroyers," had the type of ram bow so familiar in the French cruisers of ten years ago. The object was, of course, to retain water-line length while cutting away the forecastle to reduce weight. Thornycroft's retained the underwater projection of the stem to a much more limited extent in the *Ardent* and *Bruiser* class, but since that date nearly all the British vessels have had straight or sloping bows. Even the former were nearly as disadvantageous as ram bows when the boats accidentally collided with dock walls, as the damage extended below the water line, and necessitated re-docking. With the sloping stem, of course, the boat may hit something pretty hard without causing underwater damage, and now we find some of the newer French destroyers with what are almost clipper bows.

This, of course, possesses no striking novelty; it has often been suggested as favoring the introduction of greater "flare" forward. Some of the newer 27-knotters are really remarkable for this; but in some of the older boats the sides at the bow ran nearly vertically up to the forecastle, rendering them most unpleasant in anything but the calmest sea.—*The Engineer.*

SALUTING GUNS.—The Admiralty have decided to place the 3-pounder quick-firing guns which are being replaced by heavier weapons, in the battleships and cruisers not already furnished with quick-firing guns, in the proportion of four per vessel, to be mounted as a special saluting battery. This is following what has already been done in the United States Navy.—*The Engineer.*

BATTLE PRACTICE FOR 1910.—The regulations for this year's battle practice in the Navy introduce some important alterations. In future part of the practice is to be carried out on the assumption that the fire-control and range-regulating instruments and circuits have been thrown out of gear by shell fire, and this is intended to encourage initiative on the part of the gunnery and torpedo staffs. The rules further provide for the entire armament taking part in the practice. The dimensions of the target are 90 feet by 30 feet, or about one-sixth of the side area of a modern battleship. In future, also, the selection of favorable weather conditions for carrying out battle practice is to be discouraged; but allowance is to be made when the practice is carried out in bad weather. This is a move for the better.—*The Engineer.*

THE "GREAT SEA REGIMENT."—We are glad that the First Lord of the Admiralty has knocked on the head for once and all, and effectually laid, that bogey about the abolition of the Marines, which has been made to bear a share in the great naval scare recently engineered for political purposes. While it is desirable to accommodate the numbers of the great sea regiment to the necessities of the fleet for the moment—and expansion and contraction are quite easy with so many recruits on offer—yet no one expects or wishes for the removal of this part of our naval personnel. They gave us a taste of their quality during the last commission of the small cruiser *Indefatigable,* where they formed the larger portion of the crew and did many duties not hitherto allocated to members of their corps.

Some of these were seamen's duties, while others belonged to the accountant and other branches, but in each and all branches the work was performed in a most satisfactory manner by the non-commissioned officers and men, while their officers kept sea and harbor watches with great credit to themselves, and to the entire satisfaction of the captain of the ship. Their prowess behind the guns is always well brought out when the results of the gunlayers' competitions are published each year, and the Marine gunlayers are found to hold very high places among the class of guns which they man and manipulate. The work of seamen and Marines, except in a few particular duties, has been, in fact, fast merging during the last few years and since the abolition of masts and yards; yet, while it is necessary to preserve the seamen class for these particular duties, so also is it necessary to preserve the Marines for certain naval work which they perform better than bluejackets.—*United Service Gazette.*

Although the strictest secrecy has been observed as to the precise details, it is understood that the first Admiralty airship will be of a far more advanced type than any hitherto constructed. One special feature will be the magazine for carrying explosives for use in time of war, while her engines are expected to develop about 200 horsepower. She would, if required, be able to carry from twenty to thirty men, but the crew has been limited to six in order to allow for as much war matériel as possible. Within a few months this British naval airship, which is being completed by Messrs. Vickers' Sons & Maxim, at Barrow-in-Furness, will be "launched." The crew, consisting of six officers and men from His Majesty's ship *Vernon*, have been selected, and are undergoing a course of instruction. The airship was specially designed by Messrs. Spencer & Sons, of Highgate, for the purpose of patrolling the North Sea, and is of the rigid type; she will be the largest of her kind in the world with the exception of the Zeppelin airship.—*United Service Gazette.*

AUTHORITY IN THE NAVY. *Definition of "Military Command."*—In a circular just issued the Admiralty announce that they have had under consideration the authority at present given to officers of branches other than the military branch within their own departments, and the desirability of giving a clearer definition to the term "military command." It is contemplated, says their lordships, that while the "command" of all officers of branches other than the military branch over their subordinates in their own departments shall be as definite as that of officers of the military branch, an officer of the military branch who is in command of a ship or establishment, or is acting as executive officer or officer of the watch, or is in command of any work on which different branches are engaged, or is responsible for the order of a mess or of any other body of officers, shall retain the authority he at present possesses. To give effect to this decision, the following amendments of the King's Regulations and Admiralty Instructions are to be made:

Explanation of Terms.—Command.—The authority vested in officers over their subordinates within their own department.

Military Command.—The general authority vested in an officer of the military branch to command a ship or boat, or to direct any work or undertaking which requires the co-operation of different branches of the service.

No officer of the Royal Navy or Royal Marines shall be entitled to any "military command" unless he is serving on full pay and borne on the books of one of H. M. ships.

Officers of branches other than the military branch are to have command over the subordinates of their own branch, but no officer of a branch other than the military branch is to assume military command, either afloat or ashore, over the officers and men of other branches, unless the latter have been appointed or detailed for duty in his department or placed under his orders by superior authority.

The officers of His Majesty's Navy are divided into the following branches, namely: Military, engineer, medical, accountant, naval instructor, carpenter. All officers of the same branch and denomination shall rank and command according to the order in which their names stand in the official list of the officers of the Royal Navy, or, when not inserted in the list, according to the dates of their first commissions, warrants, or orders, in their existing rank; and, if only acting in the rank, according to the seniority of their respective acting appointments. Officers of the non-military branches shall rank with each other and with the officers of the military branch, the Royal Marines, and the army in the order given in the table attached to Article 222, and shall command in the same order the officers and men of their own branch as well as those of any other branch or of the Royal Marines who may be appointed or detailed for duty in their respective departments or placed under their orders by superior authority.

Notwithstanding the relative rank and authority conferred by the regulations on officers of branches other than the military branch, they are, whatever their rank, to be under the command of the captain and the executive officer of the ship in which they may be and of the officer of the watch for the time being, and in all matters outside their own departments they are to be subject to the authority of the senior officer of the military branch present or in charge of the service on which they are employed.

In no case shall officers of the non-military branches be deemed to be superior in rank to, or take precedence of, the officer appointed to command the ship or establishment in which they are employed, or the officer or other person on whom the command of such ship or establishment may properly devolve in the absence of the officer appointed to the command thereof.—*Naval and Military Record.*

THE COMBINED CRUISE.—Mr. McKenna, replying to Mr. Ashley, stated that the home and Atlantic fleets sailed on April 18 to take part in the combined exercise. The nominal strength of the squadrons participating in the cruise was 22 battleships, 13 armored cruisers, first class, 6 protected cruisers, second class, 2 unarmored cruisers, 2 destroyer depôt-ships, 4 scouts, 49 destroyers. Of these, 5 battleships, 4 armored cruisers, 2 protected cruisers, second class, 2 destroyer depôt-ships, 1 scout, and 15 destroyers did not proceed with the main body, as vessels were refitting or being docked, or preparing to refit, or were employed on other duties. Two battleships of the *Dreadnought* type were taking part in the combined exercises. Six battleships of this type were now in full commission.

THE RIGHT OF CAPTURE AT SEA (ONE POINT OF VIEW).—Towards the close of the discussion of the Naval Bill in the Commons, Mr. McKenna replied to some remarks made by Mr. J. A. Baker, the Liberal member for East Finsbury, upon the important question of maritime capture. Mr. Baker had suggested that we should agree to abandon the right to capture private property at sea in time of war. The subject is one which demands serious consideration, because it is now put forward frequently as an arrangement by which the navy estimates might be reduced. Mr. McKenna showed clearly why we cannot relinquish the right of capture, and at what a terrible disadvantage the country would be placed if it were to surrender it. Moreover, he insisted, and quite rightly, that if we were to surrender the right of capture, it does not follow that the estimates could be reduced. Mr. McKenna explained that if the time came that the navy was to be used as an engine of war, the use to which it would be put would fall into two categories. One of these is the destruction or protection of commerce, the other is defence against, or assistance to, invasion. Taking the second category first, Mr. McKenna pointed out that we could not in this country attempt the invasion of European territory, because we had no army comparable with those of the principal European Powers. Nor were we likely

to have such an army, since the country had no wish for conscription. Obviously, therefore, so far as this particular purpose is concerned, the chief European Powers are at an advantage compared to us. They might attempt to invade this country, we could not attempt to invade theirs. If, however, we turn to the other category, we find in the action that we can take in regard to an enemy's commerce an equivalent advantage to that possessed by the military Powers of Europe. With our fleet we can operate against the private property of an enemy at sea, and this is practically the only means of coercion we possess if we are driven to use the navy as an engine of war. Mr. McKenna said that he refused to be a party to the abandonment of that power, because thereby we should deprive ourselves of the only power we possess for the purpose of coercion, seeing that we have not, and cannot have, an army sufficiently powerful for invasion without conscription.

Mr. Croft, the Unionist member for Christchurch, appeared to think that in his enunciation of principle Mr. McKenna was ignoring the maxim that "the first duty of the fleet is to attack the enemy's fleet, wherever it may be." The point, as the First Lord remarked, is not relevant to the issue. Mr. McKenna was not discussing the manner in which commerce should be protected or attacked, but the wisdom or expediency of abandoning the right of maritime capture. The destruction of an enemy's fleet is a means towards an end, for if the enemy's fleet is destroyed or bottled up it is manifest that it can no longer protect its commerce. The destruction of an enemy's fleet does not necessarily mean the end of a war, nor does the destruction of an enemy's commerce; but the probability is that the latter will have a greater effect in bringing a war to a conclusion than the former. The naval correspondent of a morning contemporary appears to think that these are novel theories, but he will find no naval officer or student of naval history who does not hold that the surrender of maritime capture would take from the Empire that exists on its supremacy at sea its most effective weapon of offence. On the other hand, it is by no means certain that every naval officer, or every student of naval history, would be prepared to accept Mr. Croft's maxim that "the first duty of the fleet is to attack the enemy's fleet, wherever it may be." A very great deal depends in this case upon what Mr. Croft meant by his phrase, "the fleet." It is often said that in case of war it will be the first duty of the British Navy to seek out the enemy's ships and destroy them, and this is quite true. But it by no means follows that we are at once to hurl our battleships against the enemy's fortresses. It may be that the enemy will prefer not to risk his battle fleet at once, and a period of waiting and watching would follow, varied by skirmishes and engagements between the smaller craft on both sides. If we take, for instance, the case of war with Germany, it is most unlikely that we should send our battle fleet into the North Sea in the first stages of the war. The coercion of Germany would be carried out, so far as her commerce is concerned, more effectually by closing the means of ingress and egress by fleets at some distance from her shores and from the menace of torpedo craft. In the war between Germany and France in 1870, the flag of the former Power was swept off the seas without an engagement of any great importance being fought. It is conceivable that something of a similar character might occur in the event of a war between this Power and Germany.—*Army and Navy Gazette.*

THE RIGHT OF CAPTURE AT SEA (ANOTHER POINT OF VIEW).—Mr. F. W. Hirst, editor of the *Economist*, in an address to the Royal Philosophical Society, dealt with the paramount importance, on broad national grounds as well as in the interests of commerce, of getting rid of the right of capture at sea. We are glad that commercial communities are beginning to see the relevance of this particular reform to some of our more pressing problems of foreign policy. The Admiralty will never willingly surrender, except under strong pressure, any weapon at present enjoyed by the fleet;

its departmental business is to keep the weapon as sharp as possible. It is for other interests and other departments to insist that its edge shall not cut the hand that uses it. There is a sharp conflict between the departmental and the national view of the functions of the navy. If the navy exists not to protect British interests but rather to inflict as much injury as possible on the enemy in as short a time, the right of capture will be retained; and its corollary will be the sowing of the sea with mines that will render the deck of a tramp steamer in war nearly as dangerous a place as the fighting tops of a battleship. On the other hand, if the function of our navy is to protect British interests and to ensure that supplies of food and raw materials come in freely, and that non-combatants do not suffer more than the combatants, we shall surrender this right and purchase with it the freedom of commerce from all the dangers of war, whether of capture by cruisers or of accidental destruction by mines. The choice is between an aggressive and a defensive navy; between the free sea and the closed sea.

Recently the First Lord of the Admiralty explained in the House of Commons the reluctance of our naval authorities to relinquish this right of capture at sea. He pointed out that we have no army sufficiently large to threaten an invasion of any other nation, but with their vast armies the Continental Powers have the power of threatening us with invasion. With the right to destroy their commerce we have, however, he indicated, what really amounts to an equivalent advantage. It is true, he said, that the destruction of commerce would not mean the end of the war, but, he urged, there can be no doubt that it would go a long way towards inducing the enemy to come to terms. At all events, he contended, it is an advantage which the British Empire, depending as it does on its sea power, ought not, in its own interest, to relinquish. On the other hand, Sir Christopher Furness, along with many other eminent authorities, is convinced that the tenacity with which the British naval authorities cling to the right of capturing private property at sea, is one cause of the increased risks or fears which have led to the amazing increase of naval expenditure.

Certain it is, that Great Britain's refusal to abandon the right is one of the strongest arguments which the German Government uses to justify, in the eyes of its own people, its swollen naval programs. Mr. McKenna has gone so far as to offer to reconsider the matter upon certain conditions, and Sir Christopher Furness pleads earnestly with Sir Edward Grey not to answer in "an ice-chamber-like temper" if Germany, which is beginning to show signs of feeling the naval strain, is anxious to reopen this question. We sincerely hope that this appeal, from one of the largest shipowners in this country, will produce a good effect. On land the armies of civilized nations at war no longer destroy private property. The war is between governments and all associated with governing agency. This change, the gradual result of many civilizing influences, has enormously lessened the barbarous influence of war. Similar beneficial results would flow from the protection of private property at sea. We believe it can be proved that British commerce would gain in safety from the change, and that the offensive as well as the defensive power of the navy would be increased. But if through this means a reduction of armaments, or at any rate the cessation of rapid increases in armaments could be obtained, a still more valuable effect would be produced. Apart from questions of taxation, as Sir Christopher Furness truly says, competitive building in armaments is an immensely dangerous evil, for it fosters a spirit of antagonism that is a powerful obstacle to trade, while it increases, rather than diminishes, the risks of colossal destructive powers of two nations being used in such a manner as to set back trade and civilization for fifty years.

As Mr. Hirst pointed out in his address, the policy of commerce destruction is really moribund and obsolete. To say that the nation which possesses half the merchant shipping of the world, and is the great international carrier, would stand to lose by joining in an international treaty to make merchant ships immune from capture or destruction in naval war-

fare; to say that an island nation which imports more than half its food would suffer if food was removed from the sphere of hostilities, are surely paradoxes that require justification. If we count every great Power among our possible enemies there is not one whose food supply could be in the least menaced by our navy, and we can only think of two which would suffer much by their merchant marine being laid up in port during war. But the losses so caused by our cruisers would be negligible in comparison with the total cost of the war, and no doubt the liners could be sold quite easily to neutral nations.—*United Service Gazette.*

CANADIAN NAVAL WAR COLLEGE.—Canada's new naval college in connection with the government's naval scheme will be erected at Halifax, Nova Scotia, at a cost of £30,000. A barracks will also be built there at a cost of £40,000. Halifax will be the Atlantic naval headquarters and the Canadian Atlantic unit of the two new cruisers and six destroyers, and the *Niobe* for training purposes, which is to be purchased at a cost of £350,000, will be stationed there. It is estimated that these vessels will require a complement of 87 officers and 1549 men. Esquimault will be the Pacific headquarters with two cruisers and the *Rainbow* as the training ship. The cruisers will call for a complement of 40 officers and 742 men.—*United Service Gazette.*

ITALY.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Dante Alighieri	19,000	Gov't Yard, Castellamare.	Building.
Cavour.	22,000	" " Spezia.	"
Giulio Cesare	22,000	Ansaldo-Armstrong.	Ordered.
Leonardo da Vinci ...	22,000	Genoa (Odero).	"
Armored Cruisers.			
San Giorgio.....	9,800	Gov't Yard, Castellamare.	Under trial.
San Marco	9,800	" "	Launched Dec. 22, 1908.
Georgios Averof.....	9,800	Leghorn (Orlando.)	" Mar. 12, 1910.
Scouts.			
Quarto.....	3,600	Venice.	Ordered.
Marsala	3,600	Castellamare.	"
Nino Bixio.....	3,600	"	"

The Italian naval program will certainly not make the rapid progress that the late Minister of Marine, Admiral Mirabello, gave his readers to understand when, with remarkable optimism, he declared that the four *Dreadnoughts* would be completed in 1912. That may be the date for the *Dante Alighieri*, which was laid down last June, and is to be launched in September at Castellamare, but it will not be the case with the other three. No money is allocated to them in the present financial year. In 1910-11 it is intended to vote for the *Conte di Cavour* about £120,000, and for the *Giulio Cesare* and *Leonardo da Vinci* about £200,000 each. The total cost of these ships is given in the estimates in round figures as £2,470,000, including armament and ammunition. As is the case in France, no more armored cruisers are to be built, but the program includes three scouts, the *Quarto* being in hand at Venice, but no provision will be made for the others—*Marsala* and *Nino Bixio*—till 1910-11, and then only about £100,000 each towards a total of nearly £400,000. Several destroyers have recently been launched by Messrs. Ansaldo-Armstrong at Sestri Ponente, and seagoing torpedo-boats by Messrs. Pattison at Naples. A dock for submarines is making progress, and one or two submarines are in hand. Another point of interest is that the Italian Navy, which has been somewhat too richly provided with dockyards, is to be shorn of Naples, whereby

more energy may perhaps be developed elsewhere. The new Minister, Admiral Bettolo, speaks of increasing the naval importance of Venice. There is certainly a kind of *Drang nach Osten* in Italy to face the growing power of Austria in the Adriatic.—*Army and Navy Gazette.*

THE NEW BATTLESHIPS.—The *Dante Alighieri* will be alone of her class. She is to carry ten 12-inch guns in four middle-line turrets, of which the forward and after are 3-gun turrets and the two central 2-gun turrets raised so as to fire over the end turrets. The three other battleships are to carry thirteen 12-inch guns apiece, in three 3-gun and two 2-gun turrets, all on the middle line.

NEW SUBMARINES.—The Fiat Company, of San Giorgio, has received an order for eight submarines of 207 tons' submerged displacement, having a radius of action of 650 miles under water or of 1300 miles at 8 knots' speed on the surface. Their maximum speed is to be 12.5 knots.

JAPAN.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Satsuma	19,200	Yokosuka.	Under trial.
Aki	19,800	Kure.	Launched Apr. 15, 1907.
Kawachi	20,800	"	Building.
Settsu	20,800	Yokosuka.	"
Armored Cruisers.			
Kurama	14,600	Yokosuka.	Launched Oct. 21, 1907.
Protected Cruisers.			
Shikuma	5,000	Sasebo.	Ordered.
Yahagi	5,000	Nagasaki.	"
Hirado	5,000	Kobe.	"

As regards new vessels either completed or nearly completed for the Japanese Navy, the *Kawachi* and the *Settsu* are to be launched in October, 1910. The *Aki* has completed the installation of her machinery; the *Satsuma* has commenced her trials, and the *Ibuki* has nearly completed them. The *Kurama* will be ready for service in the course of next year, and three second-class cruisers will be completed in 1912. The construction is in contemplation of an ironclad of an improved *Kawachi* type, to steam at the rate of 21 knots per hour. The Japanese Admiralty also proposes to build two 19,000-ton armored cruisers.—*Nautical Gazette.*

THE NAVAL ESTIMATES FOR 1910.—The most important figures of the estimates have now been published: The ordinary estimates amount to £8,123,356, as against £7,358,994 for last year, showing an increase of £764,362; the extraordinary estimates amount to £7,726,814, as against £7,651,842 for last year, showing an increase of £74,971. The total amount of the estimates is £15,850,170, an increase of £839,333.

The amount to be expended on new construction is £2,226,997.

The strength of the personnel has been fixed at 41,906 officers and men.

The work of reconstructing the captured Russian ships is now almost completed. The battleships *Hizen* (ex-*Retvizan*), *Iwami* (ex-*Orel*), *Suwo* (ex-*Pobieda*), *Sagami* (ex-*Peresviet*), *Okinoshima* (ex-*Apraxine*), *Minoshima* (ex-*Senjavine*), the cruiser *Tsugaru* (ex-*Pallada*), and the cruiser *Sutsuya* (ex-*Novik*), are already fitted for sea, while the *Tango* (ex-*Poltava*), the *Iki* (ex-*Imperator Nicolai I*), and the *Soyä* (ex-*Variag*) are now nearly ready; the *Soyä* will eventually be employed as a training-ship for naval engineer students. It is, however, doubtful whether any of these ships are really worth the large sum of money which their repair and reconstruction has cost.—*Marine Rundschau.*

In response to a question in Parliament, Mr. McKenna stated that the *Aki's* armament consisted of four 12-inch, twelve 10-inch, eight 6-inch and eight 3-inch guns, with five torpedo tubes, and that the *Satsuma's* was the same, except that twelve 4.7-inch and four 3-inch guns replaced the eight 6-inch and eight 3-inch guns of the *Aki*.

When the *Kawachi* or *Settsu* has been launched, a berth will be available for an armored cruiser of 18,500 tons, which is to be laid down. The three second-class cruisers have received the names of *Hirado* (Kobe), *Shikuma* (Kobe), and *Yahagi* (Nagasaki); each is to carry six 6-inch guns and to have a speed of 26 knots.

RUSSIA.

VESSELS BUILDING.

Name.	Displacement.	Where Building.	Remarks.
Battleships.			
Emperor Paul I.....	16,900	St. Petersburg.	Launched Sept. 7, 1907.
Andrei Pervozvannui.....	16,900	"	" Oct. 20, 1906.
Evstafi	12,500	Nicolaiev.	" Oct. 1906.
Ivan Zlatoust	12,500	Sevastopol.	" May 13, 1908.
Sevastopol.....	21.000	St. Petersburg (Baltic Wks.).	Building.
Petropaviovsk	21,000	" "	"
Poltava	21,000	" (Admiralty Yd.).	"
Gangoot	21,000	" " "	"
Armored Cruisers.			
Bayan.....	7,800	St. Petersburg.	Launched Aug. 18, 1907.
Pallada	7,800	"	Under trial.
Protected Cruiser.			
Outchakoff	6,750	Sevastopol.	Building.

The statement is again made that the Russian Government intends to present to the Duma a naval program covering a long period of years, and now it is added that the total sum which it is contemplated to spend is £70,000,000, to be distributed, apparently in equal instalments, over a period of 15 years. One of 10 years was mentioned some months ago, when it was rumored that the expenditure required would be 50 millions sterling. The scheme has received the approval of the Tsar, but the government will certainly have to reckon with vigorous opposition from a strong party in the Duma, which has displayed consistent hostility to the naval administration. The manner in which naval credits have been refused reminds one of the former antipathy of the German Reichstag to the proposal to enter upon a strong naval policy, and it is possible that if the new Russian Minister of Marine should prove as inspiring an authority as did Admiral von Tirpitz in 1900 the opposition in the Duma may be bought over.—*Army and Navy Gazette.*

THE DUMA AND THE ADMIRALTY.—It was not entirely with the will of that body that the four battleships were laid down at the yards on the Neva last June, for money had to be found under some special budget regulation, so that a beginning might be made, and now only 13 per cent of the total amount required has been made available. The Duma has distrusted the ability of the naval administrators to order their business well, and the power of the establishments to carry on the work. It was even said that the government works at Ishora, which were to supply the armor for the battleships, would be unable to do this within less than 10 years. The Russian Admiralty thereupon, stung by the attacks made on its administration, issued a statement intended to refute the charges that had been made against it, and said that the four battleships would be launched in the summer of 1911 and be completed in 1913. They are expected to cost about

£2,800,000 each. The Baltic and Franco-Russian Works are to make the turbine machinery, and the Obukhoff factory the guns and gun mountings. It is understood that a good deal of foreign help will be required, though the Duma made a point of the work being done by Russian labor and with Russian materials.—*Army and Navy Gazette.*

UNITED STATES.

VESSELS BUILDING.

No.	Name. *Battleships.*	Speed. Knots.	Where Building.	% of Completion May 1.
30	Florida	20¾	Navy Yard, New York.	63.4
31	Utah	20¾	New York Shipbl'g Co.	72.0
32	Wyoming	20½	Wm. Cramp & Sons.	19.0
33	Arkansas	20½	N. Y. Shipbuilding Co.	24.0

The reassignment of vessels of the Atlantic fleet will take effect immediately after their visit to the yards in May and June. This visit will be the last occasion on which the fleet, as a whole, will be dispersed to their home yards, except for periodic docking. Vessels requiring repairs beyond the capacity of their crews will thereafter visit the yards in accordance with the plan outlined in the printed schedule, *i. e.*, the vessels of a division will go to the divisional home yard one at a time, the order of rotation depending upon the relative condition of the vessels.

In July, 1911, when the *Florida* and *Utah* are completed, and when the *New Jersey, Maine, Missouri* and *Ohio* will have been overhauled, the Atlantic fleet will be increased to 21 battleships in full commission. It will then be practicable to keep 17 battleships actively employed, the remaining 4 being at home yards for such repairs and overhauling as may be required.

Some of the benefits, which it is expected will be gained by the adoption of the new regulations, are set forth in the following schedule, but the most important of all are the certainty that the operations of the fleet will not be interrupted by the necessity for navy-yard repairs, the regulation of the work on ships at navy yards to give a practically constant amount throughout the year and the increased strength and efficiency of the active fleet due to keeping a larger number of battleships employed with greatly increased opportunity for maneuvers and exercises.

1. The Atlantic fleet will, in July, 1911, comprise 21 battleships, 4 armored cruisers, and auxiliaries.

2. The commander-in-chief will fly his flag in a ship independent of any division.

3. Each battleship division will have five ships, four of which will always be ready for active service, while the fifth will be at the division home port for necessary overhauling and repairs.

4. The fleet as a whole will visit the navy yards twice each year for docking only.

5. The ships of a division will visit its home yard in rotation, the order of rotation depending upon the relative condition of the ships. Thus each yard will usually have one battleship under repair, which will result in a practically uniform distribution of work throughout the year.

6. By recent changes in the Navy Regulations, division commanders are charged with the administration of their divisions, subject to the authority and supervision of the commander-in-chief. When divisions go to their home yards for docking, or for any other reason, a division commander will have all his ships under his supervision, and not dispersed among several yards, as is now the case.

7. Ships are assigned to divisions on the following considerations:

(a) The most powerful and fastest ships should be in the van.

(b) A division should be homogeneous.

(c) The heaviest ships should be based at New York or Norfolk, owing to the superior docking facilities at those yards.

(d) Assignments should be so made as to require the fewest possible reassignments later when new ships are added to the fleet.

(e) The commander-in-chief's flagship and all fleet auxiliaries should be based at New York, owing to its central location and superior advantages as a supply base.

8. The four battleship divisions are assigned to the four most important yards, viz., New York, Norfolk, Philadelphia and Boston. To give the Portsmouth yard its due share of work the Armored Cruiser Division is based there.

9. The Reserve fleet will be organized as soon as the vessels available for it shall have completed their overhauling. The *Iowa, Indiana* and *Massachusetts* will be ready to form the nucleus of this fleet after the Naval Academy practice cruise in 1910. The *Wisconsin* and *Kearsarge* classes will be added as soon as overhauled.

10. The overhauling of the *New Jersey, Maine, Missouri* and *Ohio* will be completed at the earliest practicable date, but not later than July 1, 1911, in order that 21 battleships may be available for the Atlantic fleet.

11. It is not contemplated that battleships will be placed out of commission in future for overhauling, but that they will be overhauled and repaired by their own crews, at their home ports, assisted by the yards.

12. By allowing each ship of the fleet an uninterrupted period of two or three months each year for overhauling and repairs, and by requiring the crews at all times to keep up current repairs and not permitting them to accumulate, it is expected that ships will not deteriorate to such an extent as to require a general overhauling, as in the past. The schedule of operations of the fleet will hereafter be formulated with a view to giving requisite opportunities throughout the year for frequent overhauling and repairs.

13. A battleship placed in reserve should be given at least a third of its full crew and as nearly a full complement as the conditions of the navy personnel will permit. By 1911 it is expected that battleships in reserve may be given crews of at least 350 men each. These crews would be expected to keep the ships in efficient condition and ready for immediate service, say, on 24 hours' notice. By combining two or three reserve crews in one ship it is expected that reserve ships will be able to go to sea for exercises and target practice.

14. It is expected, also, that vessels of the Reserve fleet will be available for Naval Academy practice cruises and for drilling State naval militia.

15. The Reserve fleet will be based at Philadelphia because of the advantages offered by the fresh-water basin at that place.

16. The most effective of the destroyers and submarines will be kept in commission, based at New York, Boston and Norfolk, as indicated on the plan. Torpedo vessels in reserve will be based at Charleston, as at present.

17. With the exception of six or seven gunboats, necessary for police work and surveying, vessels of little or no military value will be placed out of commission as soon as practicable.

18. Colliers, monitors, station ships, and others of lesser importance are omitted from this plan for the sake of brevity and for the reason that they do not materially affect the proposed scheme.

The reassignment of ships to home yards, effective July 1, 1910, is as follows:

Atlantic Fleet.—*Connecticut, Delaware, North Dakota, Michigan*, at New York; *Louisiana, South Carolina, Kansas, New Hampshire*, at Norfolk; *Georgia, Nebraska, Rhode Island, Virginia*, at Boston; *Minnesota, Vermont, Mississippi, Idaho*, at Philadelphia.

Battleships in Reserve or Out of Commission.—*New Jersey*, at Boston; *Maine, Missouri, Ohio, Wisconsin, Illinois, Alabama, Kearsarge, Kentucky*, no reassignment until after completion of overhauling; *Iowa, Massachusetts* and *Indiana*, at Philadelphia.

Special Service Squadron.—*Tennessee, Washington, North Carolina, Montana*, at Portsmouth.

Scouts.—*Chester, Salem, Birmingham,* at Boston.

Atlantic Fleet Auxiliaries.—*Celtic, Culgoa, Panther, Solace, Yankton,* at New York.

Cruisers and Gunboats.—*Des Moines,* at Boston; *Tacoma,* at New York; *Dubuque, Paducah, Marietta,* at Portsmouth; *Montgomery,* at Philadelphia; *Scorpion,* at Boston; *Eagle, Hist,* at Portsmouth; *Mayflower, Dolphin,* at New York; *Sylph,* at Washington; *Prairie,* at Philadelphia.

Atlantic Torpedo Fleet.—*Dixie* (tender), *Smith, Flusser, Lamson, Preston, Reid,* at Norfolk.

Torpedo Vessels in Reserve.—At Charleston.

Submarines.—At Boston and Norfolk.

Submarines in Reserve.—At New York.

The assignment in July, 1911, is as follows:

Atlantic Fleet.—*Connecticut* (C. in C.), *Florida, Utah, Delaware, North Dakota, Michigan,* at New York; *Louisiana, South Carolina, Kansas, Vermont, New Hampshire,* at Norfolk; *Georgia, Nebraska, New Jersey, Virginia, Ohio,* at Boston; *Minnesota, Mississippi, Idaho, Maine, Missouri,* at Philadelphia; *Tennessee, Washington, North Carolina, Montana,* at Portsmouth.

In Reserve.—*Rhode Island,* at Boston; *Iowa, Massachusetts, Indiana,* at Philadelphia.

Note.—*Rhode Island* overhauling.

Out of Commission—Overhauling.—*Wisconsin, Illinois, Alabama, Kearsarge, Kentucky,* at Philadelphia.

Note.—These vessels overhauling for reserve fleet.

Scouts.—At Boston.

Atlantic Fleet Auxiliaries.—At New York.

Gunboats for Police and Surveying.—At Portsmouth, except *Scorpion,* at Boston.

Atlantic Torpedo Fleet.—*Dixie* (tender), at New York; *Smith, Flusser, Lamson, Preston, Reid,* at Norfolk; *Paulding, Drayton, Roe, Terry, McCall, Perkins, Sterrett, Burrows, Warrington, Mayrant,* at New York; *Ammen, Trippe, Walke, Monaghan, Patterson,* at Boston.

All reserve torpedo vessels at Charleston, except *Morris* and *McKee,* at New York.

Submarines at New York, Boston and Norfolk; torpedo training ship at Boston; yachts *Mayflower* and *Dolphin,* at New York, and *Sylph,* at Washington.

The assignment in April, 1912, is as follows:

Atlantic Fleet.—*Wyoming* (C. in C.), at New York; *Arkansas, Florida, Utah, Delaware, North Dakota,* at New York; *Louisiana, Michigan, South Carolina, Vermont, New Hampshire,* at Norfolk; *Connecticut, Kansas, Minnesota, Idaho, Mississippi,* at Philadelphia; *Georgia, Nebraska, New Jersey, Rhode Island, Virginia,* at Boston; *Tennessee, Washington, North Carolina, Montana,* at Portsmouth.

Reserve Fleet.—*Missouri, Ohio, Maine, Wisconsin, Illinois, Alabama, Kearsarge, Kentucky, Iowa, Massachusetts, Indiana,* at Philadelphia.

Note.—*Maine, Missouri,* and *Ohio* available to replace vessels of Atlantic fleet that must overhaul extensively.

Scouts at Boston; and Atlantic fleet auxiliaries at New York.

Gunboats and torpedo vessels practically the same as in preceding year, with few additions of destroyers and submarines.

STEAM ENGINEERING COMPETITION.—The economy steaming competitions have effected a saving of large sums of money to the government in coal bills in the last year. During the first half of the fiscal year 1910 the vessels of the navy used 350,296 tons of coal. Compared with the previous year this represents a saving of 56,578 tons. Since December the average coal consumption of all vessels of the navy per knot run at a given speed has further decreased 5 per cent, and the average mileage per gallon of

lubricating oil has increased 8 per cent. On the U. S. S. *Kansas* there has been a continuous improvement, aggregating 12 per cent, and the *Kansas* now leads the battleships in economy of coal consumption. The port coal consumption of the three scouts has decreased 11 per cent. The most notable improvement on any vessel in the fleet was in the *Missouri*, where the amount of coal per knot under way was decreased 25 per cent, and the amount of coal used daily in port was decreased 35 per cent. On the return trip of the fleet from Guantanamo the speed was 12.4 knots, as against 11.5 going down, and, although the ships had been several months longer out of dock, the increased speed returning was maintained for about 150 tons less coal daily than was consumed going down. The saving in the first half of the year was partly due to a decrease in the amount of cruising, although the latter was to a great extent counterbalanced by a considerable increase in the average speed. The U. S. S. *New Hampshire* uses the least lubricating oil in port, while the *Montana* has used the least make-up feed water.—*Army and Navy Journal.*

The *Florida* was successfully launched on May 12 at the New York Navy Yard. She and her sister ship, the *Utah*, are of the same class as the *North Dakota* and *Delaware*, though of about 500 tons greater displacement. Some facts relative to the *Florida* are as follows: Full load displacement, 23,033 tons; length over all, 521 feet 6 inches; breadth on load water line, 88 feet 2½ inches; mean draft, 28 feet 6 inches; estimated speed, on trial, 21 knots; indicated horsepower, 28,000. The *Florida's* armament will consist of ten 12-inch guns, sixteen 5-inch rapid fire guns; four 3-pounder automatic, two 1-pounder semiautomatic, two 3-inch field guns, two 3-inch automatic and two submerged torpedo tubes. The vessel was 63.4 per cent completed when launched.

ORDNANCE AND GUNNERY. TORPEDOES.

SUPPLY OF BRITISH NAVAL ORDNANCE.—At last the senior service has placed its own officers in charge of its own ordnance and ordnance stores. It is no disparagement to the able expert officers of the Army Ordnance Corps, who have hitherto carried out all the inspections, etc., for the sister service, for them to be displaced by naval officers who are fitted by training and experience among modern naval ordnance, to take over the work. The navy's obligation to the army in this direction in the past is freely admitted; but the time had arrived for a change to meet the new conditions, as naval ordnance is now even more extensive and peculiar than army ordnance; since the number of designs and types of guns is increasing yearly for naval use. The Admiralty have placed the arrangements for inspection at contract works and the control of the inspection of projectiles and all steel ordnance in the north of England, in the hands of the Naval Ordnance Department, and this plan is also working satisfactorily. Furthermore, steps are being taken to provide more suitable accommodation at Sheffield for "testing" work in connection with the supply both of ordnance and ordnance material. Incidentally this work gives naval gunnery experts practical experience that cannot fail to be of great value to the navy and to the nation.—*United Service Gazette.*

AMMUNITION ALLOWANCE FOR BRITISH GUNNERY.—The First Lord of the Admiralty, Mr. McKenna, on being asked in Parliament to state the annual allowance of ammunition to ships in the British Navy, for preparation for and conducting gunlayers' tests, and to give similar data regarding the allowances of ammunition for battle target practice, with corresponding figures for the German fleet, said:

"The total allowance of service ammunition is 16 rounds per gun for the 10-inch and above, 32 rounds for the 9.2-inch to 12-pounders, and 40 rounds for the 6-pounder and 3-pounder sub-caliber, 160 rounds per turret

gun, and 20 for other guns, aiming rifle 400 rounds per gun. No definite number of rounds is allowed for the gunlayer's tests, each nature of gun firing for a specific time. It is considered undesirable in the public interest to publish the number of rounds fired in battle practice. We have no official information as to the allowance of ammunition in the German Navy."

THE FRENCH RIFLE.—The French Government has been repeatedly attacked in Parliament regarding the delay in issuing the automatic rifle which is eventually to supersede the present .315-inch Lebel. The latter weapon, with the new D ammunition, is admittedly a good one, but the caliber is unnecessarily large and the ammunition too heavy, as the 200 rounds carried by each man in action weigh nearly 13 pounds. The government has deferred consideration of the matter on the ground that no existing automatic rifle satisfied military requirements. It has, however, at last taken a step in advance by issuing the following circular to manufacturers and others laying down the conditions which any automatic rifle submitted to the War Office for trial will be expected to fulfil:

(1) The rifle must be loaded with a clip or charger holding not more than five rounds. It must be possible to fire the whole contents of the charger by a single pressure on the trigger without taking the rifle from the shoulder. It must also be possible to use the rifle as a single-loader, and as an ordinary magazine rifle.

(2) The rifle must be simple and durable and easy to keep in good condition. If possible it should be capable of being dismounted and assembled without the use of any tool. The breech action must be protected against rain, dust and dirt. The action of the mechanism must not be impeded by ordinary fouling, such as will occur under service conditions during continued fire. The ejection of the fired cases must not inconvenience the firer or the man beside him. The barrel must be covered, so that when it is heated by firing the soldier will not be liable to burn his hand. The rifle must be fitted with a strong, simple and easily worked safety bolt. It must be possible to unload the rifle quickly at any time. The rifle must be capable of firing blank cartridge at drill and maneuver.

(3) The weight of the rifle with the magazine empty and without bayonet must not exceed 9.25 pounds, and the recoil must be moderate.

(4) The caliber is to be not less than 6.5 millimeters (0.256 inches), and, subject, to this condition as to caliber, the ammunition is to weigh as little as possible.

(5) The rifle is to be long enough to admit of firing in two ranks, and its length with bayonet fixed is not to be appreciably less than that of the present rifle (5.97 feet).

(6) The rifle must have a "combat" sight capable of use without any setting, and such that it is easy to sight for elevation, which is more important than lateral deflection. Independently of the combat sight a second set of sights must be fitted, so arranged as to permit of accurate shooting at all ranges.

(7) The rate of continuous fire in the lying position must be at least 20 rounds per minute.

(8) The accuracy must be not inferior to that of the present Lebel rifle.

(9) The height of the trajectory at 880 yards range must not exceed 63 inches, and the remaining velocities up to 1650 yards must be not less regular than those of the present rifle.

(10) The penetration of the bullet must be as good as possible, and not inferior to that obtained with the present rifle.

Although competitors are left a free hand as to the nature of the automatic mechanism, it should not be forgotten that the French authorities are inclined to favor the power-cylinder system as opposed to the recoiling barrel. In the former system the breech mechanism is actuated by a piston working in a cylinder, to which a small portion of the powder gases are

admitted, through a hole in the barrel, at each shot. This system has been adopted in the St. Etienne machine gun now being issued. If advantage be taken of the permission to reduce the caliber to 6.5 millimeters, the last three conditions will not be easy to comply with. The present 8-millimeter rifle gives excellent shooting with the D bullet, and it is asking a good deal to require equally good performance with a smaller caliber and lighter bullet. In this connection it may be noted that the Swiss, in their new .295-inch rifle, have increased the number of grooves from three to four, and claim to have improved the shooting thereby.

The French in 1909 introduced a new powder especially designed not to foul the power-cylinder of the St. Etienne machine gun, and this powder will be used in the automatic rifle.—*The Engineer.*

A SUBSURFACE TORPEDO-BOAT.—A new type of war vessel, provided for by Congress in the Naval Appropriation Act of last year, is to be officially tested by the United States Government at Boston. It is known as the subsurface torpedo-boat, and is designed to be immune from the small gun fire now relied upon as a protection against ordinary torpedo-boats. It consists of a submarine hull, which contains all the machinery and torpedo armament, suspended from an unsinkable surface hull, divided into compartments packed with cellulose. The boat has had a preliminary trial. Tams, Lemoine & Crane, the consulting architects, report that it easily made 18 knots, thus exceeding the required speed by 2 knots. Six tons is the weight of the vessel, and its length is 46 feet. The price which the government has agreed to pay is $22,500. The small subsurface boats can be used either for coast defense or they can be carried on board of the larger vessels in an armored fleet. In the submarine hull is an 8-cylinder gasoline engine, of 150 horsepower. The explosive charge carried is 1000 pounds of guncotton. A heavily armored conning-tower on the surface hull, communicating with the submarine hull, enables the navigator to direct and control the boat's movements. Only two men are required on board.—*International Marine Engineering.*

REPORT ON U. S. ARMY ORDNANCE.—General William Crozier, Chief of Ordnance, U. S. A., in his annual report, says, on the important subject of guns and mortars:

"During the past few years the department has not been free from the occasional failures of heavy guns, which are believed to have been met with in all services, under powder pressures below those corresponding to the elastic strength of the pieces. A thorough study of the guns that failed and the experience of the department in connection with the manufacture of forgings and their assembling into built-up guns indicate conclusively that the trouble arises not from defect in the design of the cannon, but from either concealed defects in the forgings or the development of thermal or heat cracks. Though many forgings are rejected for streaks, seams or other defects during the manufacture of guns, it is manifestly impossible to examine every portion of each forging, and the danger arises from the defects lying within the finished dimensions of the forging and not apparent on the surface.

"Thermal or heat cracks are due to the high temperature of the powder gases, and increase in depth and number as the number of rounds fired increases, though the increase is more rapid in some guns than in others fired under the same conditions. To the prevalence of these cracks and the accompanying brittle condition of the metal of the surface of the bore the department attaches great importance, and has decided to reline guns as soon as these thermal cracks become very pronounced, instead of waiting until the accuracy life of the gun has been reached due to erosion and wear. All seacoast guns of 6-inch caliber and over, except mortars, manufactured hereafter will be provided with double tubes, so that if, from defective material or thermal cracks, the inner tube gives way, the damage will not

extend to the outer tube and the enveloping jacket and hoops. This method of construction will not only permit the restoration of guns, the tubes of which give way, at comparatively small cost, but will facilitate the rehabilitation of guns the accuracy life of which has been reached due to erosion and wear of the bore.

"Six 6-inch and four 14-inch guns authorized by Congress at its last session will be of the wire-wound type, and have these double tubes. The 14-inch guns will also differ from those previously manufactured in being 40-caliber instead of 34-caliber guns, which will result in a material increase in the muzzle velocity for the same powder charge and chamber. The increase of length is rendered practicable through the mounting of these guns in turrets, instead of in emplacements in which they were desired to be interchangeable with 12-inch disappearing guns.

BRITISH TORPEDO FIRING.—The torpedo firing competition of the flotillas this year will be carried out under conditions as nearly as possible approaching those which may be expected to prevail in war. The revised regulations will, it is expected, do for the torpedo branch what the gunlayers' test and battle practice have done for the gunnery branch, that is to say, will foster a spirit of emulation between the respective flotillas, which is such an important factor in securing all-round efficiency.

The competition is divided into day and night practice, the former being retained and developed with the object of affording useful exercise for the commanding officers in handling their vessels when attacking at different angles, also for the firing numbers in adjusting the directing instruments when approaching the target ship, course and speed being altered within defined limits. It will also enable the behavior of the torpedo to be watched during the entire run, and errors to be corrected. The instructions governing the day practice provide for the discharge of every torpedo carried, at ranges of over 2000 yards. The target is, as far as possible, to be a vessel of suitable length and draft, 200 feet being taken as the limit of the actual target. The torpedoes will be set at depths depending on the nature of the target used, *i. e.*, vessel or towing target. The speed of the competing vessels will be approximate to full speed in this exercise.

In the night firing each attacking vessel will be cleared for action, and all stations and arrangements will be similar to those followed in war. All tubes will have their weapons ready for discharging, but only one torpedo will be fired, this being selected at the moment of pressing home the attack, thus ensuring all weapons being kept efficient.

Special instructions provide for minimizing risk to both the target vessel and the torpedo attacking craft. Stress is laid on rapidity of fire immediately the vessel reaches the danger zone of gun fire, and every second lost will penalize the attacking craft. The practice will be controlled by independent umpires, who are to take special precautions to see that all the conditions are strictly carried out.

The whole of the vessels forming the flotillas, both home and foreign, are to take part in the competition, and the units obtaining the best results, based on the good running of the torpedoes and the skilful handling of the vessels during the attacks, are to be awarded prizes from a fund formed from the Admiralty allowance of £1 per vessel.—*Naval and Military Record.*

BRITISH BATTLE PRACTICE IN 1910.—A notable alteration will be made this year in the conditions under which the gunnery tests known as battle practice are carried out by ships of the Royal Navy. Part of the battle practice is to be carried out without the assistance of the fire-control apparatus—an innovation which will doubtless militate against record scores, but which, at the same time, will render the test a far better guide to the fighting value of the various ships. The Admiralty has also ordered that the selection of favorable weather conditions for carrying out battle practice is to be discouraged.

DANISH SUBMARINES.—The Danish Government, as the outcome of a severe competition, have placed orders for the two submarine boats which they have decided to add to the navy, with the Whitehead Company of Fiume. One of the boats will be built at Fiume, and the other at the Arsenal at Copenhagen, under the supervision of the Whitehead Company. This company is the licensee of the Electric Boat Company of New York, and the boats will therefore be of the Holland type.—*Engineering.*

THE TESTING OF EXPLOSIVES FOR RAILWAY TRANSPORTATION—A SUMMARY OF THE NEW RULES EMBODIED IN THE GERMAN RAILWAY REGULATIONS. (W. Will and F. Lenze—*Zeitschrift für das gesamte Schiess- und Sprengstoffwesen.*)—After a long series of investigations, the German Commission appointed to formulate a code of rules to govern the acceptance of explosives for railway transportation has presented a provisional report which has been incorporated in the German Railway Traffic Regulations. Dr. W. Will and Dr. F. Lenze, who were responsible for most of the experimental work on which the specifications composing the report are based, have communicated to the *Zeitschrift für das gesamte Schiess- und Sprengstoffwesen* for August 15, 1909, a brief review of the findings of the Commission, which is translated in the *Journal of the Franklin Institute* for January.

Explosives are classified under three fundamental groups, high explosives, powders, and other substances capable of explosion. The high explosives include ammonium nitrate explosives, organic nitro-compounds, nitrated chlorhydrin, nitro-cellulose, chlorate and perchlorate explosives, black powder and similar explosives, and dynamite and similar explosives. The powders include smokeless colloided nitro-cellulose powders with or without nitroglycerin, and black powder.

The investigations of the Commission have shown that certain explosives are safe to handle in unlimited quantities, others can be carried only in packages not exceeding 200 kilograms, still others can be carried only in special car loads. Under the first group are included the so-called ammonium nitrate explosives, the less dangerous nitro-compounds, damp nitrocellulose and certain explosives similar to black powder. The second group include the more insensitive chlorate and perchlorate explosives, wet organic nitro-compounds which are more dangerous than picric acid, and nitrated chlorhydrin. Special car shipments are necessary in the case of dynamite, the more dangerous black powders, gun cotton and collodion cotton, and chlorate and perchlorate explosives.

"Powders may be forwarded in packages in unlimited quantities either as in the first group, including smokeless nitro-cellulose powders (also those containing nitroglycerine) which are well colloided and have certain definite conditions of stability, or as in the second group only in carloads, which include those nitro-cellulose powders which do not attain these conditions of stability, black powder for use as a propellant and similar powders. If certain regulations as to packing are followed, these shooting powders of the second group can be forwarded in packages in quantities up to 200 kilograms."

The admission of an explosive to railway transportation under any one of these groups is governed by the results of tests of its safety in comparison with that of well-known and comparable explosives tested simultaneously, which serve as standards. The tests determine comparative, not absolute, values. The researches of the Commission have shown that the properties most seriously influencing the safety of explosives in transportation are stability in storage, sensitiveness to mechanical influences, such as blows and friction, and inflammability and liability to explosion in fire or from the influence of high temperature generally. Of these the last appears to be the most important. Manufacturers may be relied on to furnish explosives of sufficient stability, and the risk of explosion by blows and fric-

tion is minimized by the enforcement of the rules for safe packing incorporated in the Railway Traffic Regulations. Tests to determine these three properties, however, are made in all cases. In addition a high explosive submitted for admission to transportation is subjected to a quantitative analysis and to tests to determine its reaction with litmus, its tendency to form salts, and other properties which may require investigation on account of the special nature of the explosive. For example, the composite ammonium nitrate explosives are tested for safety of intermixture by the shaking test; the ammonium nitrate explosives containing nitroglycerine are tested for the exudation of nitroglycerine on the addition of water; the simple nitro-compounds for their tendency to form salts; the nitro-celluloses for their content of water and alcohol, for admixtures and for stability under special conditions; the chlorate explosives for their safety of intermixture and their stability in alternate damp and dry storage; and the dynamites for their exudation of nitroglycerine by sweating in heat. For powders there are specified an investigation of the ingredients, and tests to determine their chemical stability and purity.

"The testing of explosives for storage stability consists of long-continued storage of 10 grams in loosely closed bottles at about 75 degrees C. in thermostats or, better, in an oven heated by carbon tetrachloride. It is prescribed that the explosive shall be stored 48 hours without showing visible change, which may be recognized generally by the appearance of yellow fumes (nitrogen oxides), by a peculiar odor or color, by large loss of weight, and so on. Actually, all the hitherto admitted explosives withstand this test for more than eight days. The method of storage at 75 degrees C. is especially adapted for the determination of stability, since the test carried out at a comparatively low temperature and extending over a long period of time more nearly simulates practical conditions than the so-called heat tests which are carried out at a considerably higher temperature (over 100 degrees C.) and are used for testing nitro-cellulose and nitro-cellulose powders for stability."

Sensitiveness to percussion is tested by means of the drophammer apparatus. In testing for liability to explosion, the object is to obtain data upon the tendency of explosives to detonate in case they should catch fire during transportation in large quantities, and also to determine whether a mass detonation is to be feared in such a fire. Four different tests are applied to each high explosive. Inflammability is tested by the action of the flash of a Bickford fuse on 3 grams of the explosive. The phenomena of decomposition by slow heating are determined by heating small samples of from 0.1 to 0.5 gram to explosion or complete decomposition, and the phenomena of combustion and eventual explosion by instantaneous overheating, by throwing 5 grams on a red-hot iron plate. The effect of a fierce fire on a confined explosive is determined by calcining in a wood fire from 500 to 1000 grams, according to the density of the explosive, in sheet iron cases. Experience has shown that the combined data obtained by these methods lead to a safe conclusion as to the liability of an explosive to explosion under the influence of high temperature. The liability to explosion of powders is tested by the behavior of a charge of 0.54 gram in a Trauzl lead block when ignited by a fulminating cap.—*Engineering Magazine.*

THE TESTING OF EXPLOSIVES FOR SENSITIVENESS TO SHOCK BY THE DROPHAMMER METHOD. (By Dr. H. Kast, Berlin. Translated from the *Zeit. für das gesamte Schiess- und Sprengstoffwesen* for July 15, 1909. By W. J. Williams, F. I. C.)—The Royal Military Experimental Bureau of Berlin has been occupied for the last 20 years in the examination of explosives for military purposes. The degree of the sensitiveness to shock of these explosives is of great significance in regard to their availability. Hence the testing of their sensitiveness has always been of great importance in the investigations of this bureau.

Professor Lenze, at the last congress in Rome, reported exhaustively on the accumulated results of these investigations, so that it is unnecessary to refer to them further.

It need only be remarked that experience has shown that the drophammer must not be allowed to act directly on the explosive, chiefly for the reason that the sensitiveness, as ascertained by means of the drophammer, depends in the greatest degree on the area of the struck surface, and it is not possible to keep the struck surface unchanged under the direct action of the drophammer.

If the drophammer is allowed to act directly, or indirectly through an interposed piston, on an uneven layer of the explosive spread directly on the anvil, the area of the struck surface will change in proportion to the varying thickness of the layer in different spots. But then it is impossible to obtain strictly proportional values, because the percussive energy is distributed over surfaces of different area.

This drawback can be avoided by interposing a contrivance between the drophammer and the anvil, which is so arranged that only a strictly defined surface is exposed to the blow.

This contrivance must comply with the following conditions:

1. The surface to be struck must be a definite and invariable area.

2. The explosive must be so arranged that it cannot spread out sideways.

The chief aim in the examination of the explosive is to bring those properties into prominence which are determined by its physical condition (state of aggregation, softer or harder consistency, plasticity, fusibility, density). Therefore the explosive should be tested in a layer of defined thickness, but otherwise unalterable, both in the fluid and solid state, and at a suitable temperature.

For example, guhr-dynamite and gelatin-dynamite are more sensitive than blasting gelatin; powdered explosives are more sensitive than grained explosives; colloided gun-cotton powders are less sensitive than gun-cotton; chlorate explosives, enveloped in soft, plastic substances, are less sensitive than those prepared without such envelopes; nitroglycerin is less sensitive than dynamite.

3. Any frictional action of the blow must be avoided as carefully as possible, as explosives behave quite differently under friction to what they do under percussion.

Thus the chlorate explosives are more sensitive than dynamite to friction, but less sensitive to percussion.

Further the explosives must not be rubbed between hard materials. For this reason it is not permissible to add frictional materials (powdered glass, sand) for the artificial augmentation of the sensitiveness to shock in the comparison of dissimilar explosives, since that would affect the natural ratios of explosives sensitive to friction too seriously.

Special methods are used for testing the sensitiveness to friction.

4. There must be a constant increase of sensitiveness with the height of the fall.

5. The limits of sensitiveness must be the same whether the tests are made starting with a low fall up to a higher, or the reverse.

In the ordinary way of testing this is by no means always the case; it is very frequently observed that quite different limits are recorded when the fall starts low and is increased, than in reverse order, starting high and ending low. The reason for this variation is that in the latter case the drop-weight and the anvil are heated to a greater degree both by the explosives and by the conversion of the energy of the blow into heat, hence the explosive is, to some extent, tested at a higher temperature, in the latter case.

6. The values found at different times must agree with one another within certain narrow limits; and in particular the ratio of the sensitiveness towards that of the explosives with which it is compared must be constant.

7. The force of the blow developed with different weights for the given limit values must be about the same; but it must also be recognized that by the use of different weights the ratio of sensitiveness is somewhat changed, on account of the different physical properties of the explosive, the varying velocities of impact,[1] and the different dissipation of the kinetic energy because of the greater rebound of the lighter weights.

Explosives which can easily evade the blow (*e. g.*, fluids like nitroglycerin) show themselves more sensitive to a light, swift-acting weight than to a heavier weight.

8. Sharp differences should be observed with low falls, since experience shows that these differences are less marked as the height of the fall increases.

9. Proportionally insensitive explosives should also be tested comparatively.

10. It must be determined, beyond any doubt, whether the explosion is entire or only partial, or whether the explosive has merely burned; from these results conclusions can be drawn as to the danger of unexpected detonation induced by shock.

Care must be taken that the layer of the explosive exposed to the blow is not too thin, as this renders explosion more difficult.

In the ordinary way of testing, the air-waves from the drop-weight, and those produced by partial explosion, blow away the explosive, especially when pulverulent, so that the sample appears to have been completely exploded.

These conditions are best fulfilled by the apparatus[2] now to be described. It has been used for the last four years in the Military Experimental Bureau expressly for testing sensitiveness, and has shown itself to be reliable. The most convenient form, and the dimensions of the different parts, have been developed from a series of experiments. The apparatus has the following merits:

1. The striking surfaces are exactly one-half a square centimeter (0.0775 square inch).

2. The separate parts can be accurately adjusted.

3. It is light and easy to clean,[3] and to remove the residues of the explosive.

4. The separate parts can be easily replaced if they are damaged or too much worn.

5. The drop must not exceed 60 centimeters (2 feet) (see table below) for the most insensitive explosives.

6. The required quantity of explosive can be easily measured in the apparatus itself or can at least be easily judged.

7. Any special reaction of the explosive is easily recognized.

The following precautions must be observed in using the apparatus:

1. It must be so arranged that both the stamps fit the ring without any play, and the ring must move easily up or down the stamps.

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[1] The end velocity of the drop-weight amounts to 0.99 meters with a 5-cm. fall, to 3.43 meters with a 60-cm. fall; the duration of influence with a 1-mm. stamp is 0.001 seconds for 5-cm. fall, and 0.0003 seconds for 60-cm. fall.

[2] For diagrams of the apparatus see *Zeit. Schiess- und Sprengstoffwesen* 1, 289 (Fig. 5) 1906. Reports Rome 2, p. 529, Fig. 6, 1907. Kast, Anleitung zur chemischen und phys. Untersuchung der Spreng- und Zündstoffen, p. 1015, Fig. 238.

[3] With certain explosives, such as the easily fusible nitro-compounds, it frequently happens that the fused matter is pressed in between the stamp and the ring, and this binds the stamp. In that case a vice or a pipe-wrench is necessary to withdraw the stamp. This causes no difficulty in the use of the apparatus.

2. The stamps must be well hardened, so that they do not upset (burr) with use, and do not crack.

3. Both striking surfaces must be ground smooth, and must be exactly 8 millimeters (0.315 inch) in diameter.

4. Three different apparatuses must be used in succession in each experiment, so that any erratic action of one or the other may be detected. The apparatuses must be fixed in a cylindrical bed on the anvil to avoid damage from the drop weight.

After measuring out the prescribed quantity, the explosive is pressed together by twisting both stamps so that there is an even layer over the whole surface.

5. The experiment must be effected at a definite temperature—from 18° to 20° C. is best.

6. An apparatus which has become hot from use is cooled down to the experimental temperature.

7. At least two different drop weights must be used. The choice of weights is regulated by the sensitiveness of the explosive.

The maximum drop is:

For 2 kg. (4.4 lbs.)	60 cm.	(2 feet)
For 5 kg. (11.0 lbs.)	30 cm.	(1 foot)
For 10 kg. (22.0 lbs.)	24 cm.	(9 3/5 in.)
For 20 kg. (44.0 lbs.)	20 cm.	(8 inches)

These are sufficient for all cases. Besides the use of higher drops soon spoils the apparatus.

8. The experiment is conducted by making six trials at each height, and repeating these twice on each apparatus.

9. The effect on the explosive is accurately defined. The different points are:

A. No action.

B. Slight action, *i. e.*, the appearance of smoke, a smell of burning, explosion without audible report.

C. Explosion, subdivided into: (*a*) slight explosion, *i. e.*, slight report; (*b*) strong explosion, *i. e.*, loud report; (*c*) complete explosion.

10. The height is to be decreased until no action follows in any single instance, and is then raised until either the limit of height for the given weight is reached, or a complete explosion is obtained in all six trials.

11. The limit of sensitiveness is held to be that height from which, in as nearly as possible an unbroken series, at least one single distinct explosion occurs.

If two different explosives have their limit of sensitiveness at the same height, that height at which explosion *occurs regularly* is to be taken as the distinctive standard height.

12. The experiments must be carried out twice, on two different days.

13. Special peculiarities must decide the quantity of explosive used. In the tests of the Military Experimental Bureau an average quantity of 0.04 gram (0.62 grains) is used, which is measured out in a small cup (primer cap).—*Franklin Institute.*

MARINE ENGINEERING.

The Institution of Naval Architects has judiciously combined the scientific with the practical, and while the discussion on experimental research, particularly propeller design, occupied a prominent place in the recent session, there were many other topics dealt with of direct practical value. The subject of the design of battleships, raised by Admiral Bacon, is too large to be dealt with in a general article, and, moreover, it cannot be said that any addition was made during the discussion to the general sum of knowledge of the principles on which the Admiralty have proceeded in evolving

their designs, as laid down in general and clear terms by the author of the paper. The Admiralty and naval shipbuilders were well represented at the meeting, but it would seem that secrecy sealed their lips. The turbine question naturally found its way even into this discussion, and Professor Biles put the matter of the speed of battleships with his usual perspicuity. He very properly claimed that machinery was entitled to a certain proportion of the total weight, and Mr. Parsons, by reason of the higher efficiency of his system, had enabled the *Dreadnoughts* to be of at least 2 knots greater speed than vessels with ordinary reciprocating engines, without involving any addition to weight.

The turbine, however, came into greater prominence by reason of the papers which advocated some form of gear between the high-speed turbine and the propeller in order that both should run at the speeds which are found most efficient under given conditions. So far as warship work is concerned, the propeller coefficient of about 0.6, now realized in most cases, does not seem to justify any misgiving as to the collective efficiency of the machinery between the boiler and the propeller. In the case of low-speed vessels, however, there should be room for the interposition of speed-reducing gear. The electrical engineers were strong in their claim for the electrical gear even for warships; but it seems doubtful, with a transmission loss of from 10 to 15 per cent, if the adaptability of the system justifies its preferment. There is the difficulty of easily varying the speed; but Mr. Archibald Denny brushed this aside by contending that, by having many generating units, it would be possible to ensure more variations by stopping one or more of the generators in order to suit the particular change of ship speed desired. With low speed, however, the motors would be less efficient, and there would always be the difficulty of sea-spraying, if not also of the high saline density of the moistened air at sea, affecting injuriously the insulation. Mechanical gear, on the other hand, offers great attractions; it is proved that the loss need not be more than 1½ per cent, a result which has been attained alike by Mr. Parsons' and the Westinghouse system. The continuance of the prejudice against gearing is, in its way, characteristic of the trend of thought of engineers generally; but it is forgotten that there has been great development in the quality of metals—a point not mentioned during the discussion—while there is greater precision in manufacture. De Laval has for 20 years had very successful results, notwithstanding the great reduction in speed which he adopts.

The paper read by Mr. Parsons is of enormous significance, as in the 10-knot steamer *Vespasian* he has, under exactly the same conditions, excepting only the use of turbines and gear instead of triple-expansion engines, increased the speed by one mile per hour owing to the higher efficiency of the turbine, and has reduced the water consumption, and consequently the coal consumption, by nearly 20 per cent. The weight of the reciprocating machinery was 100 tons, as compared with 75 tons for the new installation. We have thus a very considerable addition to the amount of cargo which may be carried, a saving in coal and oil, in engine-room staff, and in upkeep. In respect to this latter item there is the important advantage that the working steam pressure, being very much lower than with modern economical engines, the first cost and upkeep of boilers and steam connections will be considerably less. When the *Vespasian* goes into service, the results of her voyage, when compared with the last voyage made with the renovated triple-expansion engines, will be watched with very considerable interest, as the system offers the advantage of the turbine system, and may indeed serve for moderate-speed passenger vessels, where the turbine alone may not be desirable in view of the speed developed.

The extreme simplicity of the system was commended. Mr. Parsons, in replying to the discussion, referred to the cradle-balanced frame for the pinion in the Westinghouse gear as unnecessary, because the pinion would adjust itself automatically, distributing half the tangential push between

the right and left-hand teeth on each side. Neither De Laval nor he uses such a balancing arrangement, and were it required he prefers giving wheels and pinions slight rotary elasticity on the shaft.—*Engineering.*

THE RATTLER'S GAS ENGINE.—The British gunboat *Rattler,* which is fitted with gas engines, has been sent to Portsmouth for the training of naval stokers. This has given rise again to the usual rumor that steam is to be abolished in some of the new ships and gas engines fitted. It is extremely improbable that anything of this sort will happen yet. The *Rattler* has been completely successful, but the experiments in her are naturally on a small scale, and the utmost likely to happen yet will be the experimental fitting of gas engines to one of the older destroyers.—*The Engineer.*

A TURBO-FAN FOR SHIPS.—To supply forced draft to the boilers of the United States torpedo-boat destroyers *Sterrett* and *Perkins,* eight steam-turbine driven fans are to be installed. The fans are of the Sirocco type, made by the American Blower Company, Troy, N. Y., and the turbines are 50-horsepower, seven-stage vertical machines, built by the Kerr Turbine Company, Wellsville, N. Y.

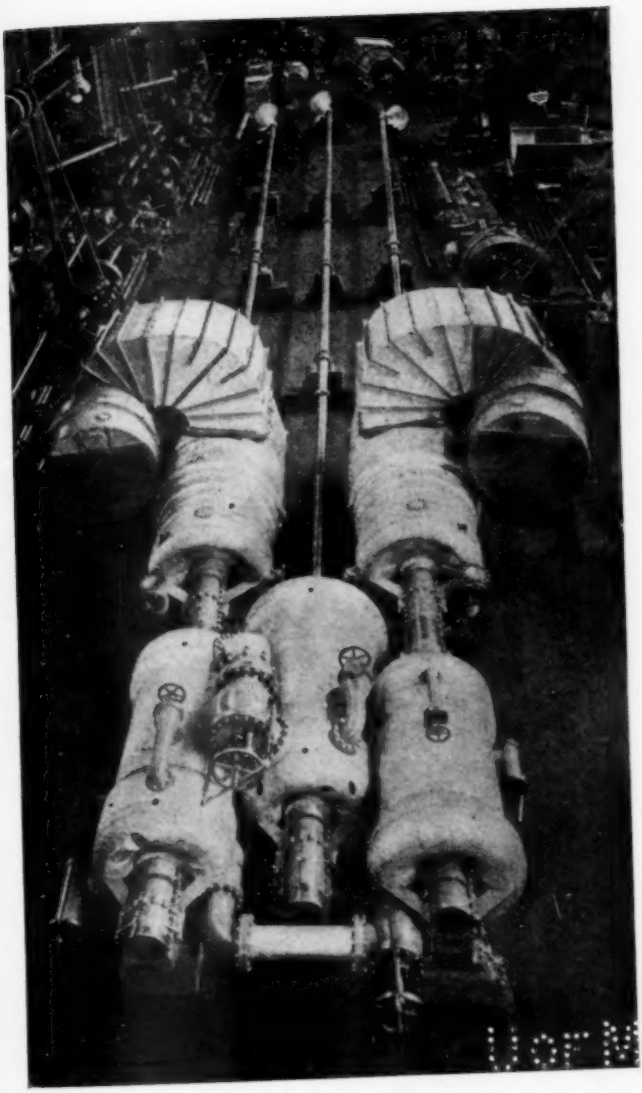
The turbines operate on a maximum steam pressure of 265 pounds, and non-condensing against a back pressure of 5 pounds. The units are placed to take air from the outside through funnels on the deck, and discharge it into the fire room through adjustable cone-shaped casings. Two fans each operating at 1655 revolutions per minute deliver 40,000 cubic feet of free air per minute into each engine room, maintaining therein a pressure equivalent to 4 inches of water.

The turbines are made right and left pattern and are arranged in pairs, one pair delivering into each fire room. One unit is bolted directly on vertical stanchions on each side of the boiler.

A very limited space is available for the installation of the blowing set. Consequently a small diameter of the turbine was required. This is made possible without reducing the power below the desired limit by using seven rotors, each 12 inches in diameter. The use of many stages with light rotors of small diameter is also of advantage in decreasing the trouble which comes from gyroscopic action, and is the more serious the larger the diameter of the rotors. It has been found that the gyroscopic action of heavy turbine wheels running in a horizontal plane and with bearings close together is enough to wear the bearings very rapidly, due to the heavy side pressure that exists when the boat rocks. By making the wheels so much smaller and placing the bearings a considerable distance apart, as in these turbines, the effect of gyroscopic action is made practically negligible.—*Iron Age.*

TURBINE MACHINERY OF THE U. S. DESTROYERS REID AND FLUSSER.—A complete description of the United States destroyers *Flusser* and *Reid,* built by the Bath Iron Works, was published in our November, 1909, issue, but we have since received a somewhat unusual photograph which shows the turbines, shafting and propellers assembled in the builders' shops. This we reproduce, since it gives an unusually clear idea of the arrangement of turbine machinery for warship propulsion.

There are five turbines of the Parsons type on three shafts, the main high-pressure turbine being on the center shaft; the starboard low-pressure and intermediate-pressure cruising turbines together with the starboard backing turbines being on the starboard shaft; and the port low-pressure and backing turbine and the high-pressure cruising turbine on the port shaft. The steam piping is so arranged that any of these turbines can be run as the initial turbine. Combinations of five, four and three turbines are permissible either by disconnecting the cruising turbines or by permitting them to revolve in vacuum. For cruising at low speeds the high-



TURBINE MACHINERY OF THE U. S. DESTROYER REID, ASSEMBLED IN THE BUILDER'S SHOP.

pressure cruising turbine is made the initial turbine by using its throttle as a modulator. At higher moderate speeds the high-pressure cruising turbine is put out of use, and at the highest speeds the main high-pressure turbine is made the initial turbine.

Steam is furnished by four Normand return-flame boilers, designed for a working pressure of 255 pounds per square inch. These boilers are pitched forward to compensate for the squatting of the stern of the ship at high speeds. Another uncommon feature of the boilers is the length of grate, which is 8 feet 8 3/16 inches.

The propellers are three-bladed of solid manganese bronze, the starboard and center screws being right-handed, and the port screw left-handed. The designed pitch and diameter of the propellers are respectively 58 and 63 inches.—*International Mar. Eng.*

MISCELLANEOUS.

NAVAL EXPERIMENTS.—Experiments may be described as the stepping-stones of progress. If engineering were an exact science experiments would be unnecessary, but, as things are, progress is often only possible by the process of trial and error. It follows that the possibility of an experiment not proving satisfactory must be faced before it is embarked upon, and steps taken to avoid as far as practicable any inconvenience which may arise. These are general considerations applicable to any branch of engineering, or, indeed, to any business whatever, and they are based on ordinary common-sense business principles. Now, in respect to progress, the Naval Service is placed in a peculiar position. Few persons, if any, will be disposed to argue that no progress is necessary or desirable, although there may occasionally be times when opinion is sharply divided as to what constitutes real progress. On the other hand, there is never wanting a body of more or less clamorous opinion both inside and outside the service which asserts that the Admiralty and its technical heads are either oblivious to progress which is going on outside the service or hostile to the introduction of improvements. To do justice, it must be admitted that while inside the service there are, as outside, degrees of progressiveness in individuals, the heads of our great technical departments are not hostile to improvements, though they may at times seem so to be by the necessities of their official position. It has to be remembered that officials of the great spending departments are not only experts charged with the administration of their respective branches, but are also in their particular sphere guardians of public money, and it is their duty to see that no money is expended unless the public service receives value for it. It is the conscientious discharge of this duty which makes for conservatism in the public departments in the matter of experiments and the introduction of new methods or machines. A public department is, moreover, always considered fair game for criticism in the Press and in Parliament, and a progressive man has always to be ready to justify, not only the course of action with which he may have identified himself, but the expenditure of public money which it entails. He also has to face the loss of prestige should the experiment or new departure not be successful, or even if it fails to elicit more than moderate approval either in the service afloat or among that section of the outside public which is competent, or thinks it is competent, to express an opinion on naval matters.

In the introduction of new appliances, history has undoubtedly shown the wisdom of making haste slowly. We need only cite as an example the introduction of the water-tube boiler. We have it on the authority of the present engineer-in-chief in his address to the Junior Institution of Engineers that there is now no boiler question. Boiler troubles are practically unknown in the service at the present day. The adoption of the water-tube boiler is completely vindicated; but what a change from the stormy

days of the Boiler Committee. If we inquire what has taken place in the meantime to make all this difference, no one would be able to tell us in one short sentence. The boilers, except in points of small detail of design, are the same as when first introduced. It is in these small details which make for efficiency, in the accumulation of experience in working, and in the accustoming of the engineering staff to the peculiarities of the water-tube boiler, that the difference lies. The moral of this is that a change which may be perfectly sound in principle and can be shown to be advantageous in the long run is not fully justified till the way has been prepared for its general introduction. The way must be prepared by familiarizing a large number of officers and men with the new thing, so that at least a fair proportion of the ship's complement shall be fully acquainted with it. That is the first principle, and the second follows as a corollary, that no new ship intended to take an immediate place in the fighting line should be fitted with an untried appliance. By following these two principles, the risk of inconvenience and confusion on the adoption of a new appliance or system is reduced to a minimum, and in the end must result in a saving of public money. It is only fair to say that these principles have generally been recognized by the Admiralty in the past, though there have been occasional lapses, due, perhaps, to strong external pressure on the one hand, or impatience to see more rapid progress on the other, which has warped the better judgment of those responsible. Of the latter, the water-tube boiler is probably a good example, as the verdict of history is that had the introduction been slower and fuller steps been taken to instruct the officers and men of the fleet, the number of failures would have been fewer, if not negligible. In the case of the electric turrets of the *Invincible*, there is reason to believe that the Admiralty yielded to external pressure against their better judgment. Mr. McKenna has now tardily admitted that the fitting of the turrets with electric gear was an experiment. As an experiment to determine whether there is or is not advantage in electric apparatus for this purpose nothing can be said against it, but an error in judgment was certainly made in making the experiment on such a large scale in a new vessel. Contrast this with the procedure adopted in the introduction of oil fuel and turbines. The introduction of the turbine may appear to have been rapid, but in reality it has taken a number of years, and to those who watched the early stages development appeared particularly slow. So, too, with oil fuel, for some years no progress was apparent at all, then once the right line of development was struck difficulties began to disappear. Experiments which had up till then been carried out on shore, or on one boiler of an old destroyer, were extended to all the boilers of a more modern destroyer. The result of successive extensions, and making sure of each step in the chain, is the eminently satisfactory system of oil burning as we have it in the navy of to-day.

There is a tendency at most times, and more especially at times like the present, when money is urgently needed for new construction, to look askance at money spent on experiments. Of course, there are experiments which ought to be repressed, such as those which the persistent inventor is always ready to propose with the view of carrying out some far-fetched scheme, or even, perhaps, with no other impulse than a gambling spirit and the hope that something may come of it. There are, however, a number of engineering questions which may in the future have a far-reaching effect on the Naval Service, and a reasonable expenditure on research work may be the means of saving in the future. The line of action is clear in all such cases. When it is decided that a *prima facie* case is made out for a new departure it should then be tried avowedly as an experiment on a comparatively small scale, and in such a way as not to interfere with the efficiency of any ship which may be required to go into the first fighting line. The Admiralty might with advantage utilize some of our obsolescent vessels by fitting them up specially with appliances under trial or experiment somewhat as the *Excellent* is used for gun trials. At present the practice

is to distribute the various articles under trial among sea-going ships, and only a limited number of officers and men become acquainted with them. By keeping several vessels for avowedly experimental purposes and changing the crews frequently a much larger number of officers and men would have experience in the innovations, and the plan would work better than an experimental station on shore, and would ultimately result in a saving of money by ensuring that nothing would be fitted in effective vessels until it was proved to be out of the experimental stage.—*The Engineer.*

MODERN NAVAL TACTICS.—The suggestive paper entitled "A New Tactical System," which Rear-Admiral Börresen, Chief of the Staff of the Norwegian Navy, read at the Royal United Service Institution recently, has scarcely received the attention which it deserved. The principal point upon which the lecturer dwelt was the disposition of the battle squadron with a view to obtaining the greatest result in view of the developments in speed and armament recently made in the units of the fleet. The conclusion at which he has arrived is that the squadron should be disposed in two divisions, so arranged that without signals or special orders one should follow the movements of the other. He dwelt upon the advantages of the new type of battleship, which reduced the length of the line, and enabled a larger concentration of the fire of heavy guns within a shorter space. With regard to tactics, Admiral Börresen expressed the view that the artillery combat would begin when the opposed fleets were at a distance of from 8000 to 11,000 yards from one another. Looking, however, to the weather likely to be met with in the North Sea, he thought that before the battle ended the fleets would be a much shorter distance apart. Apparently the admiral was of the opinion that both fleets would be equally anxious to engage, although such has not been in the past the normal condition of affairs. Sir Cyprian Bridge, in the discussion, went straight to the point when he said that adequate consideration of such a paper could only take place in the true tactical school—the fleet at sea. We are hearing in these days a good deal about staff training for the navy. It is to be hoped that those who discuss this matter will bear in mind the relevancy of Sir Cyprian Bridge's remarks on the subject.—*Army and Navy Gazette.*

EXPLOSIVES AND AEROPLANES.—The idea that such places as London, Paris, Berlin, or any other city, could be wrecked by explosives dropped from a flying machine, is characterized by Mr. Hudson Maxim, the inventor, as "the offspring of childish ignorance." Mr. Hudson Maxim (who is a brother of Sir Hiram Maxim) is one of the best accredited authorities in America, in the departure of high explosives, and in a recent address which he gave before the Brooklyn Aeronautical Association, he asserted that the time had arrived when trashy ideas about aeroplanes and dynamite, with which the public mind in Europe and the United States is saturated, should be dissipated. Airships and aeroplanes would, naturally, have their place in the warfare of the future, but in the meantime airships and aeroplanes are, he said, "ineffective and would require vast improvement as regards dropping bombs or dynamite in sufficient quantities to damage a big city." According to Mr. Maxim, we cannot make a high explosive which shall be so powerful and destructive, when employed in aerial bombs, as to fulfil the expectations and predictions of aerial war prophets. Flying machines will never be able to work wide destruction by dropping explosives from the air. Even large quantities of high explosives dropped from an aerial fleet upon battleships, coast fortifications, or the streets of large cities, would not be widely destructive. War vessels might have their structures slightly damaged, or their decks bent a bit. Holes would be blown in the paved areas of coast fortifications, and small breaches would be blown in earthworks. The few men happening to be in the vicinity of the explosion might be killed, both on warships and coast fortifications, but nothing like the havoc predicted would be caused. In

fact bombs carrying several hundred pounds each of high explosive might be dropped in the streets of large cities, and on the tops of high buildings without causing more mischief than killing a few persons, breaking a lot of glass, and damaging a few roofs.—*United Service Gazette.*

TELEPHONES FOR NOISY PLACES.—The International Telefire Company, of which the Rawles-Cobb Company, Inc., 74 Pearl street, Boston, Mass., is the selling agent, has brought out a line of portable telephones, designed especially for use amid noisy surroundings, as in factories, mills and about railroads. The instrument was developed in connection with the effort of the Navy Department to procure a suitable fire control system for its warships. The apparatus has a combination structure with transmitter and receiver suspended from the head, so that both hands are free for other purposes. It consists of a metal band, with suitable adjustment, with receivers suspended by ball and socket, which allow them to rest tightly against the head regardless of the shape of the face. The arrangement is such that the sliding adjustment on the head band for the receivers and that for the transmitter support are controlled by a single screw. A leather set, with pads to deaden all outside sound, are designed for more constant use.—*Iron Age.*

NAVAL HISTORY.—There is a special reason why the movement which culminated on April 23 in the presentation by many members of the Navy Records Society of a congratulatory address to Sir John Laughton has had the sympathy and support of this journal. It was in our editorial columns that the idea of establishing a society for preserving interesting and instructive records of the navy was first publicly advocated, and in these pages Professor Laughton, as he then was, in the course of a series of articles on Naval Literature, made the first announcement that a meeting of sympathizers with the proposal would be held at the Royal United Service Institution on Tuesday, June 13, 1893. In our issue for June 3 in that year, Sir John Laughton wrote:

"In some of my former papers I have mentioned or referred to pamphlets now of extreme rarity, not to be bought, and only to be seen in the libraries of the British Museum or the Royal United Service Institution. Others, again, though not very rare, are practically inaccessible to the great bulk of naval officers; for instance, the celebrated interesting and important 'Tracts' of Sir William Monson, which have only been published as part of a folio volume, one of the set of four, which form the smallest edition of Churchill's collection of voyages. It is thus not surprising that the idea of founding a society for the republication of such matters should have been suggested not only in the article you reproduced from the *National Observer* on May 13, but, at a considerably earlier date, in other quarters. It seems to me most desirable that such a society should be formed; and the name Monson, suggested for it by the *National Observer*, would be appropriate, and following the precedent of the older societies, the 'Camden' and the 'Hakluyt.' The pamphlets, tracts and treatises on naval affairs waiting for the action of such a society are very numerous; and of these alone there could be no lack of material for some time to come. . . . . A work still more important, still more urgently needed, is the publication of MSS. in the Museum, in private collections, or in the Record Office. The 'Memoirs Relating to the Lord Torrington,' which I edited for the Camden Society two or three years ago, is a fair sample of what there is in the Museum. . . . . So in the reports of the Historical MSS. Commission, indications of important papers are numerous; and in private possession, not noticed by this commission, there must be many journals or letters, now 100 or 200, some even 300 years old, of the very greatest interest as illustrating not only the history, but the social life of our forefathers. . . . . Anything more bald and unsatisfactory than the published histories of the naval wars under William III and Anne can

scarcely be imagined. The materials have not yet seen the light, but they must exist somewhere, if only in the Record Office. There, of course, we have an enormous, a stupendous mass of material. . . . . The only immediate probability I can see of bringing select portions of this material to light is by the action of such a society as this now suggested."

Sir John Laughton went on to point out other lines of work before the projected society, details of the life of Hawke, of Rodney, and of Howe, their letters, their courts-martial, and their journals. He instanced the chronicles of different ships which might be worked up at the Record Office, and, he added, what could be more interesting than to trace the Service descent of Nelson, as the pupil of Locker, from Hawke, the patron of Locker? It was further explained what financial basis would be necessary to start the society, and, as we have already stated, the preliminary meeting was announced, with Admiral Sir Cyprian Bridge, then the Director of Naval Intelligence, in the chair. Within less than a year after the meeting was held the society was launched, with as patrons the late Duke of Saxe-Coburg and Gotha and the Prince of Wales, then Duke of York. Its first president was Lord Spencer, and upwards of 100 members had joined it. The suggestion that the society should be named after Monson, was not adopted by the provisional council, and everyone will now agree that a better title was found in the Navy Records Society. It is beyond a doubt that, although there were many enthusiastic workers, it was due in the largest measure to the tactful influence, wide knowledge and devoted labor of Sir John Laughton that the society came into existence, and was established from the first as a successful institution. Sir John has been since, in the words of the address, "the center of its activity," and, guided by his unrivalled erudition and scholarly judgment, the annual output of the society, now aggregating 38 volumes, has enlarged the understanding of naval history, to the profit and instruction for all time of students in this field. It has, moreover, and this is no slight achievement, tended to widen the scope and infuse a healthier spirit into the methods of those who have endeavored to enrich or to enliven the literature of the sea. We desire, then, as a representative organ of the Sea Service, to cordially associate ourselves with the members of the Navy Records Society in their expression of high appreciation of Sir John Laughton's work as a pioneer in the revival of naval history, and their "regard for a life of singular and ungrudging devotion to one of the highest interests of the country."

When the history of the last five and twenty years comes to be written, the vastly increased interest taken by the British public in all matters that relate to the navy cannot fail to be regarded as one of its most significant features. That this remarkable awakening and quickened consciousness of the body politic is due in the main to the zealous efforts of a not very numerous body of writers, operating through the agency of the Press, the periodical magazines, and other literary channels, will be generally acknowledged. But to no group of writers is greater credit due for this arousing of public interest in the navy than to that which with Sir John Laughton as its central figure has laboriously opened up and marshalled the historical evidence for the sound knowledge of essential facts and principles by which only can a true grasp of the philosophy of naval history be obtained. It is under the influence of the Navy Records Society that there has grown up a school of thinking writers who have not been content to follow in the old groove, but with a far healthier conception of duty have aimed to show that the history of the navy in the past illustrates what command of the sea means, by what measures it has been obtained, and how the power thus given has been exercised. The change in method that has been brought about may be indicated by a glance at the different treatment which writers upon naval history have given to their subject. It was considered adequate and sufficient at one time to give a chronicle of events, and to record occurrences rather than to attempt an interpretation of them. Such was the work of Burchett, of James, and of Clowes; valuable indeed for purposes

of reference, but lacking from an educational point of view. Then, again, there were those who, as editors of the Navy Records' volumes, or outside the society, pursued painstaking research among original manuscripts and documents, and have garnered a host of new facts for the use of the analytical historian, the expounder of personal character, and the professional writer on strategy, tactics, and allied technical subjects. Finally, there have been those who have assayed to show the application of lessons deduced from the events of the past to the present, and to the future. Here the late Admiral Colomb led the way, and the names of a number of living writers both at home and abroad will rise to the lips; men who have in this most excellent manner taken to heart the dictum of the late Sir John Seeley that history ought to end with something that might be called a moral, "the past of England ought to give rise to a prophecy concerning her future."

There is an allied field of research in our naval annals which appeals more strongly to the taste and sympathy of some students, and which in its way may be acknowledged to have some real interest if not such substantial value as the work which is undertaken by the Naval Records Society. We refer to those matters which have been aptly summarized in the circular recently issued by Mr. Carr Laughton, who, following in the footsteps of his distinguished father, has taken upon his shoulders the congenial task of forming a Society of Nautical Antiquaries, and has begun the work, we are pleased to say, under favorable auspices and with great promise of success. It is the aim of those interested to found a periodical "wherein subscribers could record the results of their researches into, and bring forward points needing elucidation concerning, such matters as the following: The design, building and equipment of ships; the language and customs of the sea; iconography; genealogies; nautical flags, relics, medals, dress, and so forth." Evidence of the widespread interest in such matters was indicated by the circulation of the now defunct *Navy and Army Illustrated*, which devoted a portion of its pages to this subject, and which when a fortnightly publication achieved an average sale for several years of over 80,000 copies of each issue. Not many books can be found which profess to give information on these subjects, or any of them, and it is a pity that those which do are not better known. But here again the need for such a *Nautical Notes and Queries* finds demonstration. There is, moreover, need for more explorers, and fresh discoveries await the search of every student of the social life of the sea, its environment, language, costume and laws. For those who engage in the work some medium of intercommunication by which they can obtain the co-operation of, and be helpful to, one another, is essential. That their labor will be appreciated is certain, for there must be few persons who at one time or another when reading of great achievements or daring exploits have not felt the desire to call up in the mind's eye the scene and to picture to themselves the appearance of the actors. This cannot be done without a knowledge in detail of how the characters were dressed, of what the stage was like, and which "properties" were in use at the period. This is the information the Society of Nautical Antiquaries will set themselves out to supply, and it deserves therefore encouragement and support from everyone interested in naval history.—*Army and Navy Gazette.*

THE BATTLESHIP OF THE FUTURE.* (By Rear-Admiral R. H. S. Bacon, C. V. O., D. S. O., Associate.)—The battleship is solely a gun platform. The gun is at the present moment the main weapon in deciding naval actions; therefore, progress in battleship design has continuously been in the direction of increased offensive gun power, and defensive armor pro-

* Read at the spring meeting of the fifty-first session of the Institution of Naval Architects, March 16, 1910. (Slightly condensed.)

tection against gun power. The development of gun power has followed closely upon the improvements in the manufacture of steel. The cast gun with spherical shot was superseded by coil guns, rifling and pointed projectiles. The restriction of the chamber pressures which could be allowed in the early days involved low muzzle velocities and short range. Improvements in propellants and strength, and more reliable material for construction, have increased the length of range and led to longer guns and higher pressures. The result has been that the accuracy of the gun of to-day at 12,000 yards is considerably greater than the accuracy of the gun of thirty years ago at 2000 yards. At the present moment the development of the gun shows no signs of abating, and there is every reason to believe that, if required, the power of the gun can within the next few years be considerably increased. The first important questions in design are: Is such an increase necessary? What advantages would it confer, and what disadvantages would it entail? To consider these we must examine the second feature of a battleship, namely, its defensive armor.

The distinctive feature of the battleship over the cruiser is that, in the battleship, speed is sacrificed for defensive armor protection. This armor is disposed with its greatest thickness in the belt, gun positions and conning-tower, so as to protect those portions which are vital, so far as maneuvering and gun fire are concerned.

There is no doubt that the gun of the present day can, with armor-piercing projectiles at a range of about 6000 yards, penetrate any armor which can be practically mounted in a ship, and guns can be built which can penetrate this armor at ranges outside which it would be practically impossible to bring a fleet action to a decisive conclusion. Therefore, if anything approaching modern design of battleships is to be adhered to, it is perfectly hopeless to think of attempting to supply armor which would be impenetrable to any guns which may be constructed in the reasonable future. If such a thing were attempted, we would have to return to the shape and speed of the old *Inflexible*. Moreover, if such a ship were constructed, and impenetrable armor provided, the racking entailed by successive hits of heavy projectiles would cause such general leakage as to leave the ship little better off than if the armor had been penetrated.

This race between gun and armor, which has been going on for over half a century, is being decided for the moment in favor of the gun; nor is there any indication of there being a chance of improving the armor, and strengthening general construction so as to render ships reasonably immune from armor-piercing projectiles. So far, therefore, as regards mere perforation of armor with armor-piercing projectiles, there seems to be no immediate necessity for increasing the power of the gun.

The armor-piercing projectile, however, is not the most efficient shell for effecting general damage on a ship, and penetration of armor is not the sole object of gun fire. The chief damage will probably be done by heavy bursting charges. The heavier the bursting charge the greater the damage inflicted by each individual hit. There can be no choice, so far as damage is concerned, between a large burster and a small one, and therefore, from this point of view, the larger the gun and the larger the projectile the better. Again, accuracy in the performance of a gun can be best obtained by development of the gun and projectile in reasonable proportions. With power-worked mountings rate of fire need not be reduced as guns increase in size, and therefore the desirability of rapid hitting and effect of the hits when obtained both point to steady increase in the size of the guns. The sole limitation as regards progress in the size of gun carried is the increase in displacement necessary.

If the gun is to be increased in size on the same displacement, one of these three things must happen: (1) The number of guns must be reduced, or (2) the armor protection must be reduced, or (3) the speed must be reduced.

The extra weight required for the guns must be obtained from one of these three sources. We therefore find that while accuracy and efficiency point to increase in size of gun, this increase must be obtained at a sacrifice.

First, as regards displacement. It has often been said that our ships are too large, and as regards this there are two distinct issues: (1) Finance and expediency. (2) Efficiency and general utility.

The chief argument against size is the enormous cost of each ship, and, therefore, the large loss in case of sinking. Another argument is that our harbors are already too small, our docks require enlarging, and the ships become too large to handle in fleets. As regards the first of these arguments, the whole crux of the question seems to lie in the consideration as to whether a large ship or a small ship is more likely to be lost from the attack of a torpedo. Constructionally, there seems no doubt that the larger the ship the more likely she is to survive the blow of a torpedo. Surviving, however, is not the sole point. Damage by a torpedo will temporarily incapacitate a ship however large she may be, and, therefore, a bigger money value of fighting appliance will be temporarily incapacitated by a single torpedo attack in the case of the large ship than in the case of the smaller; but the smaller ship may sink, and the loss become permanent. This question, therefore, resolves itself into one of time of repair. Provided, therefore, the number of ships are kept constant, although their size is increased, no danger from the torpedo accrues to the country by building larger ships. The matter, from this point of view, becomes one of the national purse, and whether, while retaining *pro rata* numbers, we can afford to build bigger ships.

There are, however, many who uphold the view that they prefer a larger number of smaller ships to a less number of large ships, and that the money devoted to naval construction would be better spent upon numbers than upon size. The features of this contention require careful consideration. It must be assumed that an equal sum of money is spent in either case. The smaller sized ships involve carrying fewer guns, or a mixed armament of heavy and lighter guns, both of which are adverse factors to hitting at long ranges.

The most modern type of battleship at present constructed is represented by the *Dreadnought* class, and the improved succeeding vessels. Of course, it is well known that the chief features of the *Dreadnought* are the installation of an all-heavy-caliber armament of the heaviest nature, accompanied by increase in speed. Whatever arguments have been raised against this type have been proved by subsequent experience to have little weight with European navies, since all have to a large extent adopted the principal features of the *Dreadnought*. It was only to be expected that the sudden transition from the *Lord Nelson*—or really, so far as general knowledge in the navy and the country were concerned, the *King Edward* type—to the *Dreadnought* was certain to evoke criticism and comment. The directness that characterized the Admiralty administration of that period swept aside all compromise, and designed a ship with no guns of any sort except the 12-inch and 12-pounder, the latter being then considered the most suitable for dealing with destroyers.

The main reasons underlying the abolition of the secondary armament were first, that these guns tended to reduce the accuracy of hitting of the heavier guns; and secondly, that the weight, and therefore the extra tonnage that the installation demanded, could be better devoted to other purposes. The contention as regards accuracy of hitting has been well borne out by subsequent experience. Without entering into any technical reasons—and the argument is very highly technical—one point can be easily appreciated, and that is, that when the undivided attention of those directing the fire of the guns is concentrated on one type of gun only, it is far easier to correct the fire of the guns efficiently than to correct the vagaries of three calibers of guns, of varying rapidity of fire and of varying external ballistics, all of which are firing at the same object.

It must be appreciated that a 6-inch gun at long range is of no use at all against thick armor, and against the lighter armor and superstructures the small burster of the light weight of the shell militate against much real damage being done to the ship, even by a large number of such projectiles. It is held that "a hail" of such projectiles is liable to damage communications, etc. This might possibly have some weight provided that "the hail" really exists in practice, or that if it exists "the hail" hits the ship. As a matter of fact, when gun fire is handled so as to attempt to obtain hits, rapidity of fire falls very much below the possible rapidity of fire of the gun, and the actual rapidity of fire may easily fall to a quarter or less of the possible rapidity. In fact, when the fire of a quick-loading gun at long range is intermixed with other guns, rapidity of fire falls off very considerably, since it is now appreciated that rapidity of fire, unaccompanied by rapidity of hitting, is a futile waste of ammunition. It is generally considered that 6-inch fire at ordinary battle range may be discounted when accompanied by 12-inch gun fire.

There are, however, a considerable number of people who hold the view that battles will not always be fought at long range, and therefore, in thick weather, the smaller guns may more nearly approach their theoretical value. It is perfectly possible that battles may be fought at moderate ranges, but it must not be forgotten that the accuracy and rate of fire of the heavier guns is also increased *pro rata* at such ranges, whereas the actual effect of the bursters and fragments of the projectiles at these ranges is not greater than at the longer ones, and that the damage occasioned by small projectiles is in no way comparable to those of the heavier type of guns.

If it were possible to install guns of this nature in a ship without either restricting the fire of the heavier guns or of unnecessarily increasing her displacement, and if it were thoroughly understood that they were only there to be used in thick weather, there might be some advantage in installing them. The difficulty, however, of such an installation is very great. If placed below the tier of heavy guns, their position comes very close to the water; if placed on a level, they are bound to reduce the arc of fire of the heavier guns; and if placed above them they involve considerable top weight; since, wherever they are put, if they are to be of value in a fleet or single ship action, they must be protected by adequate armor. The futility of installing any guns for use in an action unless they are adequately protected against gun fire is apparent. If the fighting power of the ship with a mixed armament is to be kept the same as that of a ship with a single-caliber armament, the small gun must be in addition to the large ones. The question of the installation of such guns is, therefore, purely one of whether the designers consider the extra tonnage to be worth the advantage that may accrue. Up to the present those responsible for the construction of our ships appear to take the view that the advantage is not worth the extra displacement.

The question of mounting an intermediate type, such as the 9.2-inch or 10-inch, as well as the heaviest type, is slightly different, since these guns have a projectile more capable of inflicting damage at long range; but when the disadvantage of a dual armament is considered, in conjunction with the comparatively small amount of weight saved, and the small increase in rate of fire obtained practically by mounting such guns, instead of an additional number of heavy guns, there is not much doubt that in the future the single heavy armament will carry the day.

There is one other aspect as regards the mounting of 6-inch guns, and that is from the point of view of those guns being used merely for anti-torpedo-boat guns. This is advocated by those who look on the 6-inch gun as a better anti-torpedo-boat gun than the 4-inch. This is purely a matter of opinion, and there is a greater excuse for mounting 6-inch guns for this purpose than for use in an action, since it does not involve the necessity of providing them with armor protection. Their use would then be largely confined to defence against torpedo craft before the day of a

general action arrived, and for this purpose they require no armor protection. It is not likely that after a general action with the present-day heavy ordnance, these guns, whether protected or not, would survive to be of much practical value.

One point, however, must not be forgotten, and that is, that the possibility of mounting 6-inch guns in future ships sets a low limit on the thickness of armor belt, since it would obviously be foolish to reduce this to an amount which would allow these small guns to effect penetration at battle ranges, and therefore to lay the ship open to vital attack by small guns.

In building the small ship, speed, size of gun, and power of each hit are sacrificed. Moreover, the length of the line of battle is considerably increased. The fewer the guns mounted in each ship, the larger the number of ships that will be required for an equal number of guns; therefore, the larger number of intervals between the ships, and an equivalent increase in the length of the fighting line. This is, further, a very important consideration when the question of the use of the torpedo during an action comes to be considered.

As regards the size of our harbors, we have still plenty of places where we can berth ships 100 per cent larger than the *Dreadnought*, and without real inconvenience. Size is by no means the only inconvenience in handling a ship in a close harbor, and from practical experience I can vouch that the *Dreadnought* was from every point of view more easily handled in a close harbor than the *Irresistible*, whose tonnage was 50 per cent less. It must also be remembered that increase of size of ship in comparison with the size of harbor may be met by a development of methods and of auxiliaries such as tugs. As regards depth of water, although certain harbors may be less convenient than others, we have still plenty that can be used, even if greatly increased draft becomes a necessity.

As regards maneuvering with a fleet, no greater libel was ever published than the statement that the *Dreadnought* could not be maneuvered satisfactorily with the fleet, and any naval officer of experience who is not an automaton would find no difficulty in handling vessels of 50 per cent greater tonnage, even when in company with the lighter class of battleships. The fact that the *Dido* class were about one-third the tonnage of the *Bulwark* did not prevent their safe handling when in company.

The use of the torpedo during a fleet action can no longer be neglected. The improvements of late years in this weapon have been considerable. It has been very much the fashion up to date to disregard the possible developments of this weapon. There is no doubt that of late years in America, on the Continent, and also at Messrs. Whitehead's, there have been introduced improvements into the torpedo which have totally altered the character and use of that weapon. It is not improbable that these improvements are merely in their infancy, and that before many years have elapsed we may find ourselves confronted with a weapon of considerably greater powers. If the range of the torpedo can be brought up to 6000 yards it has great possibilities in an action. There is no doubt that it is far easier to hit one of twelve ships with a torpedo than to hit a single ship aimed at, and therefore the longer the line of ships, and the greater their numbers, the more vulnerable they will be to attack by destroyers at long range in an action. This is an additional argument in favor of increasing the size of individual ships rather than the number of ships in the line.

As regards retention of the present thickness of armor protection, this is a matter which may before long undergo considerable modification, and the armor problem of the future appears to resolve itself into the answer to the following question:

Supposing the guns of the enemy can with certainty pierce armor protection at reasonable fighting range, what is the most economical thickness of armor to adopt? Very many considerations are involved in the answer to this question, such as the position and thickness of horizontal armor, but considering the enormous sacrifice in weight now made to carry thick

armor protection, it is a matter that before long may undergo bold and radical revision.

We now come to the third possibility of saving weight, and that is, reduction in speed. Probably there was no point among the improvements introduced into the *Dreadnought* that was more violently attacked than the increase in speed from 19 to 21 knots, and the attempts made to prove that such an increase was of no value were legion. It is probable that this increase will in time be looked upon as one of the most valuable features of this design. It has been impossible for anyone to argue that, from a strategical point of view, such an increase in speed was not of value, but from a tactical point of view this increase was bitterly attacked. This attack arose from not taking a sufficiently broad view of the possibilities of the future.

The speed of a ship when she is built remains practically constant all her life. Judging from past experience it is improbable that the designed speed of a ship will ever be subsequently increased. Fifteen years ahead is a long time to look forward to, but the careful student of naval progress is forced to take into account the possibilities of all naval weapons. The improvements in the torpedo must in time introduce a class of tactics more analogous to single ship than fleet actions. It is in such a class of tactics that speed will become a valuable factor, and it is highly probable that the speed of battleships will increase up to that of the cruisers.

It is therefore probable that to get the maximum efficiency out of the gun and yet not to decrease the numbers mounted in a ship, increase in tonnage and reduction of belt armor of battleships will be features in future construction, and that for other reasons the value of speed will be enhanced.

It does not seem possible that the size of gun will be limited unless all nations agree to do so, and such an agreement is highly improbable. It would be a foolish policy on the part of any nation to install smaller guns than those carried in the ships of rival Powers. Again, it would be almost as unwise to provide guns of less damaging power than modern design permits. The number of guns carried in a ship cannot well be reduced below that of the *Dreadnought*, otherwise the difficulty of hitting at long range with such an armament will be considerably increased.

To sum up, all the considerations of offence and defence point to increase in size of battleships as modern gun construction advances. But, since the modern battleship no longer holds the supreme position which, in the old days, made the battleship the sole ultimate arbiter of sea power, it is improbable that, as the torpedo improves, battleships, unable to defend themselves against any form of torpedo craft, will be built merely to fight battleships. The functions of the large cruiser will therefore be assumed by the battleship, high speed will become more and more necessary, and armor protection will be less accentuated than at present. The link between the ocean-going destroyer and the battleship will become closer, and we may reasonably expect that the huge monsters of the future will always be accompanied by torpedo craft of high sea-going speed as defensive and offensive satellites.

The battleship as now known will probably develop from a single ship into a battle unit, consisting of a large armored cruiser with attendant torpedo craft. Line of battle, as we now know it, will be radically modified, and the fleet action of the future will, in course of time, develop into an aggregation of duels between opposing battle units. The tactics of such units open up a vista of most exhilarating speculation, and will afford to the naval officer of the future a scope for his tactical skill never dreamed of by us or our predecessors.

The whole future is pregnant with radical obliteration of our present notions as regards tactics, but we may confidently prophesy that size of ships and power of gun will increase and increase until war, the great arbitrator among theories, will confirm or reconstitute our opinions regarding naval armaments.—*The Engineer.*

THE NEW STAR IDENTIFICATION TABLES OF THE HYDROGRAPHIC OFFICE.—The United States Hydrographic Office has just brought out, as a result of extensive and laborious computations, a convenient and important work in recognition of the value of observations of the stars and planets for the purpose of ascertaining the compass error and the geographical position of ships at sea and of the necessity of employing such observations in consequence of the increased speed of vessels employed in ocean transit. With every attempt to make ships go faster and get farther in a given time, greater frequency in determinations of geographical position become more important, because the reckoning of ships is rendered more and more uncertain, by the diverting forces of the elements, in proportion to the distance traversed from the latest ascertained position.

The navigator, able only to find his ship's position and the error of the compass by observations of the sun, has, therefore, but a limited and consequently, imperfect command of the art of navigation. In these days of keen competition, when the difference of a few tons of coal, or a few hours in the length of passage, may mean all the difference between profit and loss, or between safety and disaster, he must recognize the great advantage and extreme importance of employing also in his service the stars that "rule by night."

Sir John Herschel said: "Every well determined star, from the moment its place is registered, becomes to the astronomer, the geographer, the navigator, the surveyor, a point of departure which can never deceive or fail him, the same forever and in all places, of a delicacy so extreme as to be a test for every instrument yet invented by man, yet equally adapted for the most ordinary purposes; as available for regulating a town clock as for conducting a navy to the Indies; as effective for mapping down the intricacies of a petty barony as for adjusting the boundaries of Trans-Atlantic empires."

From remote antiquity, the heavens were mapped out into constellations and groups of stars in which, by the aid of a fertile imagination, some resemblance was traced to the various beasts, birds, fishes, and classical heroes whose names were assigned to them. The most ancient records allude to the constellations by these distinctive names. In the Old Testament, in the book of Job, we read of the "bands of Orion" and "the sweet influence of the Pleiades"; and in the writings of Hesiod and Homer are names as familiar to the astronomer of to-day as they were to the observer in the ages when science was in its dawn. Besides the designation by name of the most conspicuous stars and of the groups or constellations, the stars in each constellation are distinguished for reference by letters and numbers; and in connection with the name or other distinguishing designation of each of them, astronomers have registered its place in the firmament by measured co-ordinates which are called declination and right ascension and which are somewhat comparable with latitude and longitude on the surface of the earth.

In finding any star in the heavens from a map of the constellations, it is necessary to refer to some one star or constellation as known, such as the Great Bear, also called by the Latin name Ursa Major, and then to recognize others in accordance with the configuration of the map; for, by supposing a line to pass through two such known stars, it may also pass through or near another star whose name is required; or by producing a line to a certain distance estimated by the eye, the same end is obtained.

Probably the reason why stellar observations have been so little practiced at sea is to be found in the extreme inconvenience, if not impossibility, of identifying the observed stars by means of star maps or by recognizing the configuration of the heavens. In stormy weather with partly clouded skies obscuring the arrangement of the constellations, the navigator was frequently prevented from recognizing any of the few stars showing at a time and hence from obtaining results at the very times when they might be most indispensable to his safety. How many sights have been found

useless because the observer thought he was observing one star when in reality pointing his telescope at another? How many coveted results have escaped the navigator, because, on account of clouds obscuring its neighbors, he could not feel sure of the identity of the one star that was visible?

What the Hydrographic Office has done to relieve ocean commerce of the impediments thus arising is to pave the way for the unrestricted application of the science of astronomy to navigation by providing in simple tabular form the means for converting the altitude and approximate bearing of any star, which the navigator may measure with his sextant and compass, into the corresponding declination and right ascension, the coordinates by which they are catalogued in the lists giving the names and magnitudes of stars. The navigator is thus rendered independent of any previous knowledge of the constellations and the names of the stars he may observe, and, instead of being confined to the employment in his observations of those stars which he may be able to recognize, is enabled to identify any star that is bright enough to observe.—C. W. Littlehales in the *Bulletin of the American Geographical Society.*

THE NEW GOVERNMENT CHARTS.—The new government charts, recently adopted for use in the navy, will probably come into general use in the near future. On these charts the compass points are discarded and the figures for the 360 degrees of the circle are substituted. Hereafter it will be "Steady on 270 Quartermaster." Of this system, a writer in *Shipping Illustrated,* says:

"'Twas six bells in the morning watch, our ship was heading 30, dark clouds came up from 23, the sea grew rough and dirty; our course was changed to 35, then 30 and a quarter; perhaps you understand these terms—I don't know as you orter. 'How is her head?' the skipper bawled. 'She's heading 32.' 'Keep 4 points off to 28 and then I think she'll do.' 'Avast here, Capt!' the helmsman cried. 'I'm clever and I'm able, but I'm blamed if I can steer your ship by the multiplication table.' The skipper pored long o'er his charts and tried to make his course—'20 by 10 and then add 1 makes 31, of course, and then subtracting 3 or 4 I think I'll have it right.' Oh, how the wind blew 23 that dog-goned stormy night!

"But while the Cap was adding up, subtracting, multiplying, the *Sarah Clark* plunged on a reef, her course had been defying; and, mate, of all the souls aboard I'm the only one alive. This happened near the Friendship Isles—up 10 and 3 and 5."—*Nautical Gazette.*

THE "SHENANDOAH."—There is now on her way from San Francisco to New York, and presumably rapidly approaching this port, the big four-masted wooden sailing ship *Shenandoah,* the last survivor of four ships of the same type built by the Sewalls of Bath, Me., all of which achieved fame as fast sailers and great carriers; they were engaged chiefly in the grain trade between Pacific and European ports. Of the three sister ships two were burned and one was wrecked; and the *Shenandoah* comes here to be stripped of her spars and canvas and to end her days as a towing barge. As described in the current issue of *Shipping Illustrated,* she is 299.7 feet in length, beam 49.1 feet and depth 19.9 feet; she measures 3407 gross tons and 3154 net; she has a spread of about 11,000 square yards of canvas, has frequently logged over 300 knots in a day, and once made the voyage from the Golden Gate to Sandy Hook in ninety-six days; in a race against five foreign ships between San Francisco and Havre in 1891 she beat them all, making the run from anchorage to anchorage in 109 days and carrying 5300 tons of wheat, the largest shipment of grain ever taken from California to a French port. The *Shenandoah* was built in 1890 and cost about $175,000; she has probably paid for herself many times over, but was sold recently for only $36,000, to be delivered in New York.

Why is this exceptionally fine cargo carrier and sailer, with her great record of only twenty years of life, to be converted into a lowly coal barge and do service along the coast when she has sailed every sea and is still capable of repeating her past performances? Why are her owners willing to take $36,000 for her when she has made quite as much as that, perhaps more, on a single voyage, and could do it again under similar conditions? The answer is short, but the story leading up to it is a long one: The competition with foreign steam craft is so acute and the cost of equipping, manning and sailing an American ship is so much greater than for a foreign one that a ship of the *Shenandoah's* class cannot be sailed nowadays with profit to her owners. It was simply a choice between selling her or having her tied up idle in port.

The *Shenandoah* is eighty-seven days out. She ought to show up off the Hook early in June. If the two houses of Congress would only make a small appropriation for an excursion over here by the anti-shipping aid lawmakers to take a look at her the sight of her great and graceful hull and of her tall masts, topmasts and topgallants piercing the sky (it is 217 feet from her main deck to her main truck), and all so soon to be degraded, might operate to make them ashamed of themselves and metamorphose them into subsidists forthwith.—*New York Commercial.*

PROPAGATION OF WIRELESS TELEGRAPH WAVES.—It is now well known that the distance to which long-distance wireless telegraphy can be carried at night is usually considerably greater than the corresponding distance in the daytime. That is, the electric waves which come over a wide ocean are usually much stronger by night than by day. This weakening effect accompanying daylight is inappreciable at short ranges. On the other hand, it is more noticeable in the tropics. It is not appreciably influenced by cloudy weather. To account for these facts, it is now generally supposed that the sun's rays electrically modify the air, and a number of experimental facts bear out this hypothesis. In the first place, the daylight sky is blue, in the absence of clouds, which color of the sky has been shown to be due to the absorption and scattering reflection of blue, violet and ultraviolet solar rays by the atmosphere, and particularly by the upper layers of the atmosphere. Again, we know that the temperature of the air falls regularly as we ascend, until a height of some 15 km. is reached, and then there is a belt of stationary temperature, or even of a slight increase in temperature. It is supposed that the blue and ultraviolet sunlight absorbed in this very low-pressure layer of air may warm it up sufficiently to keep the temperature nearly uniform for a considerable distance. Finally, we know, from laboratory experiments, that ultraviolet light passing through air in a closed vessel makes the air a partial conductor, or, as we say, ionizes the air. Moreover, this conductivity-creating action is more marked at low pressures than at normal pressures. It is greater in a nearly exhausted vessel than in the ordinary air we breathe.

All these facts point to insulation in the upper atmosphere as the cause of the daylight weakening of wireless telegraphy. The effect would naturally be more pronounced in the tropics, because the sun's rays are there more intense. The effect would naturally be insignificant at distances of 100 km. or less, because at such short ranges the waves have not had room to expand and suffer absorption in the upper layers of the atmosphere, say, 25 km. high. The presence or absence of clouds would naturally not affect the action, because, as meteorologists say, clouds do not form above 15 km. from the earth, and dense clouds form much below that level, whereas this effect occurs higher up. During the night, the air tends to recompose itself into non-conductivity, the condition favorable to the complete transmission of electric waves. With the return of daylight, ionization recommences. The upper air becomes turbid, electrically speaking. An electric wave, advancing through the partially ionized belt of atmosphere, causes ions or

charged particles to be bodily displaced, like electrified pith-balls, and the aggregate amount of work done in slightly displacing all the ions contained in a cubic kilometer of such turbid air means the absorption of the same amount of energy from the passing wave. Every cubic kilometer traversed absorbs just so much electric energy as toll. The stronger and less heavily taxed portions of the wave, near the earth's surface, automatically feed energy upward to distribute the tax; and so the whole wave is attenuated as it advances. Curiously enough, the weakening influence of daylight between a sending and a receiving station seems to be most pronounced when one of the stations is in sunshine, while the other is in shadow—that is, when one is in the day, and the other in the night. This is perhaps due to the fact that the sun's rays at such times strike tangentially to the earth's surface between the stations and tend to create temporarily a vertical wall of division between ionized and unionized air. This wall in the upper air may act temporarily as a reflecting surface, or electric barrier, between the two stations, restricting the transmission to the hole in the wall underneath the ionized layer.

If the ionizing action of sunlight were confined to a sharply defined belt of atmosphere, such that the conductivity of the air was rendered very fair in the belt, but the conductivity ceased suddenly beneath, then the electric waves would be greatly strengthened instead of being weakened. This is for the reason that such a clearly defined conducting layer would act in the upper air like the clearly defined conducting layer of salt water at the level of the sea, so that reflection would occur at both surfaces. The waves would then spread out like the spokes of a wheel, in two dimensions only, and with a uniform height not exceeding, say, 25 km., whereas, in night air, they spread out in three dimensions. In ionized day air they are subjected to rapid absorption in the turbid ill-defined upper layers with worse results than even pure tri-dimensional expansion.

An article on the influences that shorten and extend the range of long-distance wireless telegraphy, by Mr. Paul Schwarzhaupt, has recently been published in the *Electrotechnische Zeitschrift*, as is mentioned in our Digest. A number of cases are detailed, in which stations of some 500 km. normal radius have been heard by ships or other stations at much greater distances during the night hours. A voyage of the steamship *Bremen*, from Naples to Bremen, is discussed at some length, and the approximate strength of day and night signals heard, throughout this journey, from the Norddeich station in northwestern Germany, is presented in a curve-sheet. It would seem that signals are radiated out more powerfully along the valleys of large rivers, such as the Rhone and Garonne. This may mean that the contour, as well as the conductivity, of the earth's surface following a river-bed may be favorable to transmission. Moreover, it appears that as the ship approached Genoa, just beyond the Alpine barrier from Norddeich, the daylight signals steadily weakened, but the night signals steadily increased. This may perhaps be explained by the fact that both the contour and the degree of surface conductivity in the Alpine mountain range are very unfavorable to transmission, so that during the day the signals get steadily fainter as the ship approaches the barrier, but at night time not only may some waves get across the barrier directly, but they will also swing around on each side, and the total night signal will then increase because the distance from Norddeich is steadily reduced. In other words, the waves only radiate truly from the sending station when the absorption is uniform in all directions; otherwise they bend and deflect toward and around the region of greater absorption.—*Electrical World.*

BOOK NOTICES.

"O Bloqueio Moderno." By Lieutenant José Cardoso, P. R. N. (França Amado, Coimbra. Price, 3s. 6d.)

This is a book written in clear and suggestive language on theories about the modern blockade, by a Portuguese naval officer. The book is divided into six chapters. In the first chapter the author discusses the importance of blockade operations in connection with naval strategy; in the second he gives an account of the more important blockade operations, from the siege of Miletus until modern times; in the third chapter he reviews modern factors of naval efficiency, their capabilities and limitations from the point of view of blockade strategy; in the fourth chapter he describes the organization of a modern blockade, dealing with the distribution of the blockading ships, reconnoissance operations by day and night time, communications between ships and between the tactical units and their bases, torpedo and submarine defence, etc., with theoretical and practical data and information. The fifth chapter contains an interesting survey of opinion on coast defence held by British, French, Italian, and Portuguese experts, and the author's own views on the matter. In the last chapter Lieutenant Cardozo discusses the peculiar case of the strategical situation of Portugal, referring to its naval defence, continental and colonial. All the subjects are treated according to the most modern views, and form, on the whole, an interesting study on naval strategy.

From the *Naval & Military Record* of April 13, 1910.

"Rear-Admirals Schley, Sampson and Cervera." A review of the naval campaigns of 1898, in pursuit and destruction of the Spanish fleet commanded by Rear-Admiral Pascual Cervera. By James Parker, formerly Lieutenant-Commander U. S. N., and one of the counsel for Rear-Admiral Schley before the Court of Inquiry of 1903 that tried that admiral. Large octavo; cloth. Illustrated by portraits and diagrams. $3.00 net; postage, 20 cents.

The Neale Publishing Company, Flatiron Building, New York; 431 Eleventh street, Washington.

"Three Rivers: The Hudson, the Potomac, the James." A retrospect of peace and war. By General Joseph P. Farley, U. S. A. Illustrated with ten sketches from nature by the author in water colors, reproduced in color. Octavo, cloth; handsome letterpress and binding. $2.00 net; postage, 15 cents.

The Neale Publishing Company, Flatiron Building, New York; 431 Eleventh street, Washington.

"Apontamentos sobre Tactica e Estrategia." By Lieutenant José Cardosa, P. R. N. (with preface by General Moraes Sarmento). França Amado, Coimbra.

"I. L'Esprit de la Guerre Navale." In 3 vols., by René Daveluy, Capitaine de Frégate. Vol. 1—La Stratégie (2d edition of L'Etude sur la stratégie navale). Vol. 2—La Tactique (2d edition of L'Etude sur le combat naval). Vol. 3—L'Organisation des Forces. (Berger-Levrault & Co., Rue des Beaux-Arts, Paris, France.)

Ten years ago, the author determined to write a popular work on "The Spirit of Naval Warfare," in three parts, Strategy, Tactics, and Organization. He soon found that he had undertaken too much; and that it would be a long time before he could carry out his program. He therefore decided to publish separate studies, not under a general title. "L'étude sur le combat naval" appeared in 1902; "L'étude sur la stratégie navale," in 1905. These two books represented the first two parts of his original plan, to which he returned when new editions became necessary.

The result is one of the most important works on naval warfare that has yet appeared. The first volume, "Strategy," has been translated into English by Professor Philip R. Alger, U. S. Navy, and published by the Naval Institute. It is to be hoped that the other two volumes will be translated also, for the benefit of those who prefer to do their reading in English.

Practically all parts of the first two volumes are of universal interest. Parts of "Organization" deal only with the French navy; but the volume as a whole has special interest for us at the present time, when questions of organization are receiving so much attention.

STRATEGY.

(Quotations are from Professor Alger's translation.)

"Strategy" is in five parts: Principles of Naval Strategy, Elements of Naval Strategy, Operations, Auxiliaries of Strategy (Plan of Campaign, Public Opinion, Preparation, Grand Maneuvers, War Game, Examples.)

The author employs the historical method throughout; instinct, our worst enemy, must not be our guide; history, the experience of nations, can alone show us things under their true aspect. Many instructive historical examples are given in proof of his conclusions. Frederick the Great said: "A thorough knowledge of war can only be gained by experience, and by the study of history, and of the battles of the great captains."

The author breaks away from the French idea of fighting on the defensive; he shows that England has become mistress of the seas by always attacking. "Some claim that the purpose of war is to insure the safety of the coast, and to attack the enemy's coasts; others tell us that its rôle is to destroy commerce; still others wish to use it to assure the success of an invasion. Very well, then! destroy the enemy, and you will secure all these results at once; the protection of the coast will be assured; and you will be able to conclude successfully whatever operations the circumstances demand." "Military strategy teaches to attack the principal army first. It is the same upon the sea." "Who will be the victor? The most active, the most skillful, the most tenacious, the one who has the material best suited to the ends of war. The offensive will secure decisive results particularly at the beginning of the war. If, by impetuosity of attack, the projects of an adversary are anticipated, a fixed direction is given to the

operations; a menace is created which upsets all the enemy's previsions." "The characteristic of the offensive is to impose the attack, instead of submitting to it; it has manifested itself in history by the fact that almost all victories have been won on the enemy's coast."

Many examples are given to show that "geographical conditions have weighed upon operations in all wars."

The author does not think highly of tactical scouting: "It derives from an idea that is more seductive than practical. . . . . Usually, it will be known when the enemy is near, and there is a chance of meeting them. Then, a more sustained watchfulness will take the place of scouting."

"The strategical value of advanced bases really depends only upon their geographical position."

"A naval force, devoid of radius of action, is exclusively defensive. It may thwart the enemy's plans, but it will never endanger him. . . . . The defense is passive; the offense is active. But the latter is inconceivable without movement."

With regard to speed, "By dint of exalting it, we have come to deify it. . . . . speed is not a force, but a means of giving value to force; and one has no right to sacrifice a single gun to it."

An extensive history of attacks on coasts is given to show their futility.

The chapter on "The Conquest of Territory over Seas" was translated by Captain H. S. Knapp, U. S. N.; and has appeared in the Naval Institute PROCEEDINGS.

"Blockades will have no more fears for us when our flotilla of submarines has attained its full development."

The chapter on "Public Opinion" as a powerful adversary to the proper conduct of operations is of special interest to us.

The conclusion of the whole matter is "The Doctrine: To build the ships that are needed, and no others; to give them the armament suitable to each, and to equip them properly, it is needful to know what it is wished to do, and how it is to be done; an aim and a doctrine are necessary."

The criticism, still true of the French navy, made by a French Minister of Marine, "Our fleet is a fleet of samples" would have applied to us also, a few years ago.

TACTICS.

(Quotations are translations from the original.)

The divisions are: Introduction, Historical, Purpose of Battle, Armament, Mass, Battle Range, Battle Order and Battle Position, The Approach, Battle, Reserves, Pursuit, Night Battle, Signals, Tactics of Navigation and Tactics of Battle, Command, Moral Elements, Physical Elements, Torpedo-Boat Tactics.

"This is not a book of 'Tactics,' but a collection of considerations about battle, which I have tried to disengage from the facts. The title is, nevertheless, justified, because tactics are intimately connected with battle, of which they are an auxiliary." "Many officers question the utility of a Tactical Book; and their opinion is partly justified by the narrow sense in which they use the word. To them, Tactics are only a formula, or a formation, and they look in vain for either in our code of signals, misled

by its official title; the value of the evolutions it contains is not evident, because nowhere is the end indicated to which they lead."

"Every battle is composed of two distinct parts: one, moral, the conception; the other, material, the execution." "It can therefore be said that the conception of battle remains fixed throughout the ages; and that the execution is subject to the double influence of time and local circumstances."

The author holds that the line of battle (line ahead) of the 17th and 18th centuries was impotent because it was founded on two errors: it was false in principle, and it rested on a fiction. "It was false in principle, because, when one fights, one ought to think of attacking, and not of defending one's self; and ought only to defend one's self to the extent that the defense seconds the offense. But the line of battle is a defensive order; it gets its force from the mutual support of the vessels in the line." It rests on a fiction: "Time had consecrated certain conventional principles; the various phases of a battle were determined in advance by a tacit agreement, the clauses of which were respected faithfully for a century and a half. A battle was no more than a kind of a duel, in which, by mutual consent, the adversaries were placed in a given position; then the fight commenced according to the rules of the art."

"When armor and the ram made their appearance together, the gun went through a period of eclipse." "The same reasoning that had already served for sailing ships was now applied to the ram." The line abreast was adopted, a defensive order. The ram, however, more dangerous to friend than to foe, has now disappeared.

"The purpose of battle is the annihilation of the enemy. It is not useless, as one might be tempted to think, to become penetrated with this principle, which ought to guide all the acts of our professional life." "Indecisive battles are sterile." "Victory is the true protection of the matériel." "There are not two ways of fighting; there is only one: it is necessary to try to destroy the enemy. That is the purpose; tactics are the means."

In the Russo-Japanese battle of the 10th of August, the author claims that the morale of the Japanese won, not the gun. At Tsushima, Togo "used all his means, while preventing the enemy from doing the same." "One can only give directing principles, whose application will vary according to the special circumstances of each encounter. These principles are: To destroy the cohesion of the enemy, to demoralize him, to force him to quit the fight, leaving prizes behind him. This is the purpose. To realize these different objectives, one needs an instrument of irresistible force, certain in its action. This is the mass, or the concentration of forces. Here is the weapon of victory. Materially, the mass destroys all defense at the point attacked; morally, it takes away from those who are subjected to its weight all chance of resistance; and when troops fight without hope, they defend themselves badly. It does not act with method; it utilizes all the elements of which it is composed to the best interest of the moment, in making use of every occasion born of the circumstances, in employing all weapons (gun, ram, and torpedo) in accordance with the immediate needs. It takes away nothing from the importance of the armament, because it

gets its force from the accumulation of a large number of weapons at the same point." "Great captains, not formulas, win battles." "The tactics of weapons must be subordinated to the tactics of masses."

The author does not favor great battle ranges. "If you want to hurt your enemy, you must hit him, and not be content with looking at him angrily." "Let us be brave enough to tell the truth. The origin of the theory of great battle ranges is in the sentiment that always leads us to place ourselves at the limit of vulnerability of weapons; as one confusedly feels one's slight efficiency, one hunts arguments for self-justification. . . . . We must distrust ourselves; and be guided by reason, not by instinct." "Battle at long ranges is an equitable division between the attack and the defense; it gives to one what it takes from the other."

"Like tactics in general, of which it is an element, order ought to be only the instrument of a will; this will pursues an objective, which the order of battle ought to realize. If the commander-in-chief must subordinate his plans to the employment of a more or less seductive order, he becomes its slave; he is no longer free to do as he pleases. . . . . Finally, the order is less important than the relative positions of the combatants. . . . . Besides, an order is always more or less defensive, since it is determined by the position of the ships with relation to each other, and not to the enemy." "The aim to pursue is therefore to distribute the forces in such a way as to throw them in mass against the weak points of the enemy, in order to deliver a fatal blow at the very start. To obtain this objective, it is not necessary to have an order—it is enough to maneuver with order."

Regarding the approach: "A few simple movements, foreseen, and studied in advance, will alone be possible; they will serve to get the ships within effective range of the enemy, and in the position which will seem most favorable to the admiral. It is at this moment that the qualities of the commander-in-chief will be revealed; the fate of the battle will depend on how he places his forces."

"A battle is not only an exchange of shots; it is also a struggle between two wills. . . . . The most obstinate wins."

"The best way to increase the value of torpedo-boats is to make them act in mass. The effects of the charge of a group are not only multiplied by the number of the units; each boat supports the others by contributing to multiply the objectives of, and in receiving a part of the fire of the enemy. . . . . In the attack in mass, the leading boats are sacrificed. It is an assault; and the first in the breach have little chance to return unhurt. If torpedo-boats are sent separately against the enemy, each will run as many risks as the first boat of a group." "It is wrong to consider that their action (torpedo-boats') should be independent of that of the battleships."

ORGANIZATION.

(Quotations are translations from the original.)

The table of contents is given to show on how many topics the author touches: Introduction—Part I. Personnel: The Officer (Rôle, Qualities, Instruction, Recruiting, Grades, Promotion, Politics). The Commander-in-Chief. The Crew (The Military Bond, Courage, Discipline, Patriotism,

Professional Instruction, Promotion).—Part II. Matériel: The Three Fleets, Types of Vessels (Battleships, Scouts, Armored Cruisers, Torpedo-boats and Destroyers, Auxiliaries). The Rational Fleet, Composition of Forces. Distribution of Forces. Organization.—Part III. Administration: Bureaucracy, Paper Work, The Services, Departmental Duties.

"Too often, in fact, strategy, as well as tactics, has been the slave of circumstance. Unable to do well, one was content to do something."

"Every one has often asked himself which of the two factors, matériel and personnel, is the more important. Well, they are equally important. The most powerful matériel has no value in ignorant hands; and the most skillful workman will always do imperfect work with bad tools. It is true that, during long periods of peace, matériel receives greater attention because it is easier to make it a means of comparison of the strength of different navies. Pride also plays its part; no one is willing to own a type of ship, a model of gun, manifestly inferior to those of other nations. The mind is thus constantly occupied with the improvement of the matériel. On the other hand, everything conspires against the personnel. Its real value only appears on the field of battle. In peace, it is only known to the professionals, and often, too, by very indefinite signs. Two navies can look equal, because it is impossible to see the fault that is corrupting one of them. This absence of external manifestations is the reason why the personnel is more readily sacrificed. In words, it will not seem to be neglected; pleasure will be taken in exalting discipline; appeal will be made on every occasion, or without occasion, to the devotion and the spirit of sacrifice of troops and crews, as if evoking these qualities was sufficient to bring them to life. But, in practice, the necessity of economy, badly understood humanitarian ideas, a hunt for cheap popularity, will bring about concessions which injure the personnel, both in number and quality."

"Each vocation puts a special stamp on those who follow it, both physically and morally. Through force of always doing the same things together, a special little world is formed, with common manners and habits, and a characteristic way of thinking." "Character is the first quality of an officer. That is, he must have, above all, to a very high degree, the sentiment of his mission, and of the duties it creates. It is by his character, more than by his stripes, that the officer imposes his authority." At the Osborne Naval College, there is a sign: "Character is of more value than science."

"The sea is, above all, a field of action; where struggle is perpetual. A struggle of will to form, instruct and train the crews; a struggle with the elements during ordinary cruising; finally, a deadly struggle with one's own kind, during war. This does not mean that to be a seaman is to be a man of action; but at sea, better than anywhere else, one can become a man of action, because the life demands action. On the other hand, all those who, by profession, have a tendency to sedentary habits, gradually lose all activity, both physical and moral." "Action is not, like character, an affair of temperament; it is rather a question of training." "In a military life action is necessary to all; but it is infinitely more important to the chief than to his subordinates."

"Cruising is the anti-chamber of battle. Before fighting, it is necessary to get to the field of battle."

"Everything in life is a question of habit. One can get used to action just as easily as one can get used to laziness; one can even get used to war, and to the idea of death. The more victims there are of war, the greater the development of the military spirit, and of sacrifice. The more deaths there are, the more people are ready to give up their lives." "Let us preserve them (the officers) from sedentary habits, which have an enervating effect, and are incompatible with sea life."

"In all occupations requiring physical effort, bodily vigor has a special importance."

"Many people imagine that a young man commencing a military career is conscious of his future duties. Far from it. At the age at which one enters on his vocation, one has reflected little, and, in turning to the profession of arms one obeys very varied impulses; but, among these, it is not the work and the duties of the vocation that predominate. Some want to be naval officers from a spirit of adventure; others, simply because their fathers were; others, because they live in a sea port, where the maritime element predominates, and because, from childhood, their outlook has been restricted to the sea." "The sentiment of duty is, in fact, the most powerful support we have in times of difficulty, to preserve us from weaknesses, because it shows us the road to follow. "The sentiment of duty gives more than courage; it gives tranquility of spirit."

Chapters III, IV, V, VI, VII, on Instruction, Recruiting, Grades, Promotion, and Politics, have special reference to the French navy.

"We have said that the career of an officer is divided into two periods. During the first, he obeys; and he has need, above all, of instruction. During the second, he commands, and he has need, above all, of authority. Here we have two different states, each of which demands special qualities; and all officers are not fitted for both. We have all known brilliant and active officers who seemed to be called to the highest destinies; but, alas, as soon as they acquired command rank, they were seen to be so mediocre that it was surprising that any one could ever have been deceived about them." . . . . "On the other hand, officers are met, who, in the lower grades, seemed destined to hold only subordinate places, little appreciated by their chiefs on account of their not tractable characters, they carried on routine duties without enthusiasm; but some unexpected circumstance was enough to bring them into notice, and they showed their power. Their aptitudes, slumbering in the daily routine of life, are awakened by the whip of action; and they then display those qualities of command that lead them to the highest places."

"Inferiors are never deceived about the value of their chiefs; infinite details reveal it to them." "It is customary to say that to know how to command, one must know how to obey." "Power to command is a gift of nature. It is not acquired; but it is developed by the exercise of authority."

"An excessive centralization, together with paper work which has increased during the past twenty years like a weed, has given us a wrong idea of command. The chiefs of our naval forces are like employees in the

office of the Secretary of the Navy; desk work absorbs their time and their thought, and does not permit them to command in the military sense of the word. A chief does not need to mix himself up in the details of the service, nor to regulate unimportant questions, nor to write purely formal signatures. He has been given assistants for such work. He is there to give impulse to his forces; and to keep them in a state of constant preparation. If all his time is taken up with petty details, he has none for more serious interests, for his task requires, above all, meditation and reflection. There are people, however, who imagine that the exercise of command consists in wanting to see everything and wanting to do everything."

The author declares that young men must be put in command: "Experience is a relative term; and that of the chief only begins when he takes command, and feels the weight of responsibility. It is not on the eve of retirement that one must begin to acquire it." "Finally, the question of age is intimately connected with initiative. Initiative is not even a quality; it is a necessary condition in the exercise of authority." . . . . "The habit of command develops initiative just as physical exercises develop the biceps; but apprenticeship must not be commenced too late." "It is customary to say that, when one is ill, it is necessary to call in, depending on the case, either an old physician or a young surgeon. War is a surgical operation; a young surgeon must be called in."

The startling statement is made that man is a coward; that courage is not a natural sentiment; that discipline teaches courage. "In discipline lies the force of armies."

"The defense of the coasts, the protection of colonies, stoppage of commerce, are the results of maritime supremacy. To pretend, on the other hand, to obtain this supremacy by simultaneously striving for the defense of the coast, the protection of colonies, the destruction of commerce, and the attack on hostile squadrons, is to approach the problem of war from the wrong end—it is to put the cart before the horse."

"The navy can no more do without scouts than the army can do without cavalry."

When M. Lockroy became Minister of Marine, he was astounded to find that no war plans had been made. The section charged with this work also has under it all questions of matériel, and many other things. The details of the day's work were so numerous that there was no time for anything else. "And this is why preparation for war remains forgotten in a pigeon hole, where all questions slumber which always ought to be solved, and never are."

The bureaucratic organization of the Navy Department, with its immense (and useless) number of documents of all kinds, including reports of innumerable committees, burdensome returns from ships, almost infinite endorsements, etc., is severely criticised.

H. F. BRYAN, Commander, U. S. N.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. F. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904.

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906.

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907.

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908.

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909.

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910.

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotten, U. S. N.

NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-seventh year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fee to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life-members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly, and may be obtained by non-members upon application to the Secretary and Treasurer at Annapolis, Md. Inventors of articles connected with the naval profession will be afforded an opportunity of exhibiting and explaining their inventions. A description of such inventions as may be deemed by the Board of Control of use to the service will be published in the Proceedings.

Single copies of the Proceedings, $1.00. Back numbers and complete sets can be obtained by applying to the Secretary and Treasurer, Annapolis, Md.

Annual subscriptions for non-members, $3.50. Annual dues for members and associate members, $3.00. Life members fee, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1911.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1911. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

PHILIP R. ALGER,
Professor, U. S. N., Secretary and Treasurer.